VOLUME 24 / NUMBER 3
FEBRUARY 8, 1986
ACC. NOS. N86-12199 TO N86-13285

STAR
AN ABSTRACT JOURNAL

Scientific and Technical Aerospace Reports

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Scientific and Technical Aerospace Reports, Volume 24, is prepared by the NASA Scientific and Technical Information Facility operated for the National Aeronautics and Space Administration by RMS Associates.

The Administrator of the National Aeronautics and Space Administration has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Agency. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through March 22, 1988.

US ISSN 0036-8741

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Includes aeronautics (general); aerodynamics; air transportation and safety; aircraft communications and navigation; aircraft design, testing and performance; aircraft instrumentation; aircraft propulsion and power; aircraft stability and control; and research and support facilities (air).

For related information see also *Astronautics*.

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For related information see also *34 Fluid Mechanics and Heat Transfer*.

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Includes planetology; and manned and unmanned flights.
For spacecraft design see *18 Spacecraft Design, Testing and Performance.* For space stations see *15 Launch Vehicles and Space Vehicles.*

92 SOLAR PHYSICS 545
Includes solar activity, solar flares, solar radiation and sunspots.

93 SPACE RADIATION 546
Includes cosmic radiation; and inner and outer earth's radiation belts.
For biological effects of radiation see *52 Aerospace Medicine.* For theory see *73 Nuclear and High-Energy Physics.*

GENERAL

99 GENERAL N.A.

Note: N.A. means that no abstracts were assigned to this category for this issue.

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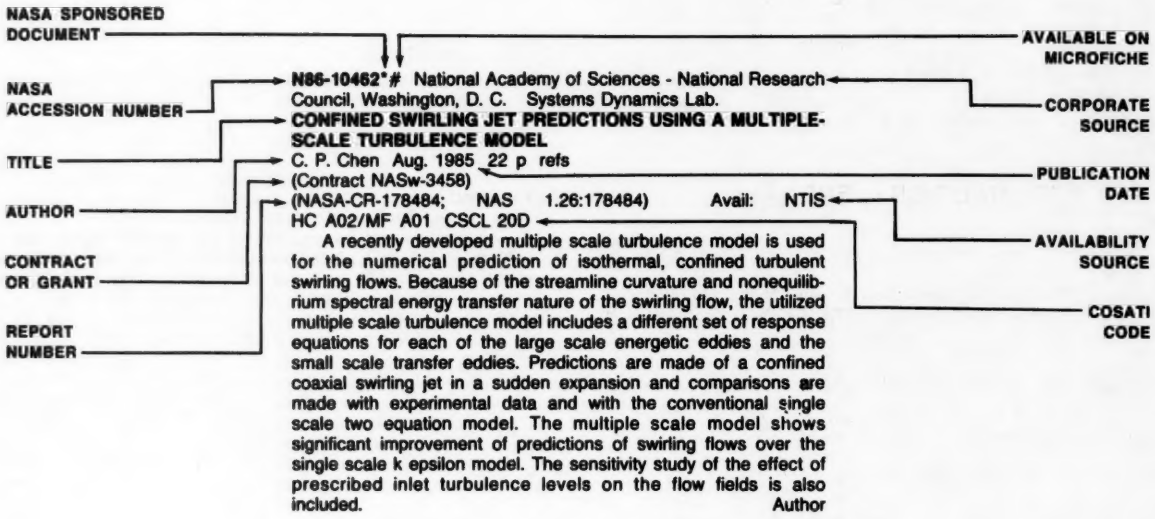
TYPICAL CITATION AND ABSTRACT


NASA SPONSORED DOCUMENT
AVAILABLE ON MICROFICHE
NASA ACCESSION NUMBER
N86-10462*# National Academy of Sciences - National Research Council, Washington, D. C. Systems Dynamics Lab.
CORPORATE SOURCE
TITLE
CONFINED SWIRLING JET PREDICTIONS USING A MULTIPLE-SCALE TURBULENCE MODEL
AUTHOR
C. P. Chen Aug. 1985 22 p refs
PUBLICATION DATE
CONTRACT OR GRANT
(Contract NASw-3458)
REPORT NUMBER
(NASA-CR-178484; NAS 1.26:178484) Avail: NTIS
AVAILABILITY SOURCE
HC A02/MF A01 CSCL 20D
COSATI CODE
A recently developed multiple scale turbulence model is used for the numerical prediction of isothermal, confined turbulent swirling flows. Because of the streamline curvature and nonequilibrium spectral energy transfer nature of the swirling flow, the utilized multiple scale turbulence model includes a different set of response equations for each of the large scale energetic eddies and the small scale transfer eddies. Predictions are made of a confined coaxial swirling jet in a sudden expansion and comparisons are made with experimental data and with the conventional single scale two equation model. The multiple scale model shows significant improvement of predictions of swirling flows over the single scale k epsilon model. The sensitivity study of the effect of prescribed inlet turbulence levels on the flow fields is also included.
Author

VOLUME 24 NUMBER 3 / FEBRUARY 8, 1986

Scientific and Technical Aerospace Reports

A Semimonthly Publication of the National Aeronautics and Space Administration

01 AERONAUTICS (GENERAL)

N86-12199# Aeronautical Research Labs., Melbourne (Australia).
A SURVEY OF AERONAUTICAL STRUCTURAL RESEARCH IN AUSTRALIA
F. H. Hooke Dec. 1984 45 p
(AD-A157211; ARL/STRUC-TM-394) Avail: NTIS HC A03/MF A01 CSCL 01/3

A survey of Aeronautical structural research in Australia has spanned over more than 40 years, from the establishment of the C.S.I.R. Division of Aeronautics in 1939. Industry, civil aviation and the armed services have benefited from the expertise of Structures Division in problem solving, as well as from ad-hoc research and, perhaps less immediately, from basic research. Not every avenue has been able to be explored. A major subject of research, structural fatigue, arose from an accident in 1945, and each new development in design and material has brought new problems. Standards of safety and risk have been explored. New technology of fiber composites permits better tailoring of strength and stiffness to requirements: this and the introduction to aircraft of active controls offer benefits and problems for the future.
Author (GRA)

N86-12200# Air Force Academy, Colo.
AIR FORCE ACADEMY AERONAUTICS DIGEST Final Report
J. E. DeJongh, W. H. Heiser, and M. Hale Apr. 1985 269 p
(AD-A157215; USAFA-TR-85-2) Avail: NTIS HC A12/MF A01 CSCL 20/4

Some articles of the digest are entitled: The Seven-Hole Pressure Probe; Wind Tunnel Study on the Drag Effects of an Aft-Mounted Ventral Fin on a T-38 Model; An Experimental Investigation of an Airfoil Undergoing Large Amplitude Pitching Motions; Interrelated Effects of Pitch Rate and Pivot Point on Airfoil Dynamic Stall. Other topics covered are: An Examination of Curve Smoothing Using Digital Filter Theory; Flight Test Measurement of the Aerodynamic Effect of Thrust Level on Lift and Drag; and Flight Control System Design for a Computer Controlled Aircraft with Limited Sensors. GRA

02 AERODYNAMICS

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

For related information see also *34 Fluid Mechanics and Heat Transfer.*

N86-12201 Virginia Polytechnic Inst. and State Univ., Blacksburg.
EXPERIMENTAL INVESTIGATION OF 3-D TURBULENT FREE SHEAR FLOW PAST PROPELLERS AND WINDMILLS Ph.D. Thesis
Mohamed Abbas Kotb 1984 242 p
Avail: Univ. Microfilms Order No. DA8507194

An experimental investigation of the flowfield region near a 0.49 m. (1.615 ft), 3 bladed, horizontal axis rotor was conducted in the VPI 2 m x 2 m (6 ft x 6 ft) wind tunnel. Two different modes of operations were studied - propeller and windmill. For each case, tests were run with a uniform approach flow as a base line condition, and the main test series was run with a variable mesh wire grid upstream to produce an approach flow with an essentially linear velocity gradient. The results are compared to elucidate the effects of the non-uniform approach flow. Differences regarding the magnitudes and profile shapes of the mean flowfield parameters and turbulence quantities under uniform and shear flows are reported and discussed in detail. For the propeller case the measured turbulence quantities were sensitive to the upstream shear flow. This was manifested in the form of higher turbulence intensities and shear stresses. For the windmill case, the axial interference velocity was higher under the shear inflow condition while the swirl, radial flow and static pressure profiles did not show significant differences from the uniform case. Author

N86-12202*# Grumman Aerospace Corp., Bethpage, N.Y.
GRUMFOIL: A COMPUTER CODE FOR THE VISCOUS TRANSONIC FLOW OVER AIRFOILS Final Report
H. R. Mead and R. E. Melnik Washington NASA Oct. 1985 76 p refs
(Contract NAS1-12426)
(NASA-CR-3806; NAS 1.26:3806; RE-681) Avail: NTIS HC A05/MF A01 CSCL 01A

A user's manual which describes the operation of the computer program, GRUMFOIL is presented. The program computes the viscous transonic flow over two dimensional airfoils using a boundary layer type viscid-inviscid interaction approach. The inviscid solution is obtained by a multigrid method for the full potential equation. The boundary layer solution is based on integral entrainment methods. E.A.K.

N86-12203*# Southampton Univ. (England). Dept. of Aeronautics and Astronautics.
THE STATUS OF TWO-DIMENSIONAL TESTING AT HIGH TRANSONIC SPEEDS IN THE UNIVERSITY OF SOUTHAMPTON TRANSONIC SELF-STREAMLINING WIND TUNNEL Progress Report
Mark C. Lewis Washington NASA Oct. 1985 57 p refs
(Grant NsG-7172)
(NASA-CR-3919; NAS 1.26:3919) Avail: NTIS HC A04/MF A01 CSCL 01A

This report briefly outlines the progress made during the last 2 years in extending the operational range of the Transonic Self-Streamlining Wind Tunnel (at the University of Southampton) into high subsonic speeds. Analytical preparation completed in order to achieve such an extension is outlined and a summary of the preliminary model validation tests is presented. Future work necessary to allow further validation and development is discussed. Author

N86-12204*# Southampton Univ. (England). Dept. of Aeronautics and Astronautics.
DERIVATION OF JACK MOVEMENT INFLUENCE COEFFICIENTS AS A BASIS FOR SELECTING WALL CONTOURS GIVING REDUCED LEVELS OF INTERFERENCE IN FLEXIBLE WALLED TEST SECTIONS
M. J. Goodyer Oct. 1985 14 p refs Prepared for Kentron International, Inc., Hampton, Va.
(Contract NAS1-16000)
(NASA-CR-177992; NAS 1.26:177992) Avail: NTIS HC A02/MF A01 CSCL 01A

This report covers work done in a transonic wind tunnel towards providing data on the influence of the movement of wall-control jacks on the Mach number perturbations along the test section. The data is derived using an existing streamline-curvature program, and in application is reduced to matrices of influence coefficients. Author

N86-12205*# Rockwell International Corp., Columbus, Ohio. Aircraft Operations.
AERODYNAMIC CHARACTERISTICS OF A PROPULSIVE WING-CANARD CONCEPT AT STOL SPEEDS Interim Report
V. R. Stewart Nov. 1985 423 p refs
(Contract NAS1-17171)
(NASA-CR-177982; NAS 1.26:177982; NA84-0148) Avail: NTIS HC A18/MF A01 CSCL 01A

A full span model of a wing/canard concept representing a fighter configuration has been tested at STOL conditions in the NASA Langley 4 x 7 meter tunnel. The results of this test are presented, and comparisons are made to previous data of the same configuration tested as a semispan model. The potential of the propulsive wing/canard to develop very high lift coefficients was investigated with several nozzle spans (nozzle aspect ratios). Although longitudinal trim was not accomplished with the blowing distributions and configurations tested, the propulsive wing/canard appears to offer an approach to managing the large negative pitching moments associated with trailing edge flap blowing. Also presented are data showing the effects of large flap deflections and relative wing/canard positions. Presented in the appendix to the report are limited lateral-directional and ground effects data, as well as wing downwash measurements. Author

N86-12206*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
EFFECT OF SURFACE WAVINESS ON A SUPERCRITICAL LAMINAR-FLOW-CONTROL AIRFOIL
Dal V. Maddalon and Mark L. McMillin Oct. 1983 25 p refs
(NASA-TM-85705; NAS 1.15:85705) Avail: NTIS HC A02/MF A01 CSCL 01A

Calculations were made of the effects of surface waviness on the external pressure of a supercritical airfoil at design conditions. Wave parameters varied include amplitude, wavelength, phase, and number of cycles. Effects of single and multiple waves are calculated at various chordwise locations. General trends of surface waviness effects on pressure distribution are determined and these solutions are reported. Contour deviations are imposed on the upper surface of the airfoil. Results are presented in a manner designed to facilitate ready comparison with the ideal contour static pressure distribution. Author

N86-12207*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
SOME RECENT ADVANCES IN COMPUTATIONAL AERODYNAMICS FOR HELICOPTER APPLICATIONS
W. J. McCroskey and J. D. Baeder (Army Aviation and Technology Activity-AVSCOM, Moffett Field, Calif.) Oct. 1985 20 p refs
(NASA-TM-86777; Rept-85345; NAS 1.15:86777; USAVSCOM-TR-85-A-06) Avail: NTIS HC A02/MF A01 CSCL 01A

The growing application of computational aerodynamics to nonlinear helicopter problems is outlined, with particular emphasis on several recent quasi-two-dimensional examples that used the thin-layer Navier-Stokes equations and an eddy-viscosity model to approximate turbulence. Rotor blade section characteristics can now be calculated accurately over a wide range of transonic flow conditions. However, a finite-difference simulation of the complete flow field about a helicopter in forward flight is not currently feasible, despite the impressive progress that is being made in both two and three dimensions. The principal limitations are today's computer speeds and memories, algorithm and solution methods, grid generation, vortex modeling, structural and aerodynamic coupling, and a shortage of engineers who are skilled in both computational fluid dynamics and helicopter aerodynamics and dynamics. Author

N86-12208*# Grumman Aerospace Corp., Bethpage, N.Y.
AN IMPROVED VISCID/INVISCID INTERACTION PROCEDURE FOR TRANSONIC FLOW OVER AIRFOILS Final Report
R. E. Melnik, R. R. Chow, H. R. Mead, and A. Jameson Washington NASA Oct. 1985 132 p refs
(Contract NAS1-12426)
(NASA-CR-3805; NAS 1.26:3805; RE-682) Avail: NTIS HC A07/MF A01 CSCL 01A

A new interacting boundary layer approach for computing the viscous transonic flow over airfoils is described. The theory includes a complete treatment of viscous interaction effects induced by the wake and accounts for normal pressure gradient effects across the boundary layer near trailing edges. The method is based on systematic expansions of the full Reynolds equation of turbulent flow in the limit of Reynolds numbers, Reynolds infinity. Procedures are developed for incorporating the local trailing edge solution into the numerical solution of the coupled full potential and integral boundary layer equations. Although the theory is strictly applicable to airfoils with cusped or nearly cusped trailing edges and to turbulent boundary layers that remain fully attached to the airfoil surface, the method was successfully applied to more general airfoils and to flows with small separation zones. Comparisons of theoretical solutions with wind tunnel data indicate the present method can accurately predict the section characteristics of airfoils including the absolute levels of drag. E.A.K.

N86-12209# Naval Ship Research and Development Center, Bethesda, Md. Ship Performance Dept.
AN EVALUATION OF FOUR METHODS OF NUMERICAL ANALYSIS FOR TWO-DIMENSIONAL AIRFOIL FLOWS. REVISION Departmental Report
R. Burke 6 Jul. 1985 29 p
(S12-66)
(AD-A157248; DTNSRDC/SPD-1139-01-Rev) Avail: NTIS HC A03/MF A01 CSCL 09/2

Four computer programs for analyzing the inviscid and boundary layer flow over two dimensional airfoils are exercised in comparisons against experimental data from two wind tunnel studies. The solution method of each computer program is discussed, followed by a description of the airfoil geometries used in the model comparisons. Measured values of pressure distribution, turbulent separation point, and boundary layer properties are compared against predicted values. GRA

N86-12210# Naval Weapons Center, China Lake, Calif.
PARACHUTE RECOVERY SYSTEMS DESIGN MANUAL, CHAPTERS 1 THROUGH 4 OFFPRINT Partial Report, Jan. 1984 - Jul. 1985
T. W. Knacke Jul. 1985 56 p
(AD-A157839; AD-E900488; NWC-TP-6575-CH-1/4) Avail: NTIS HC A04/MF A01 CSCL 01/3

This manual provides the recovery system engineer in Government and industry with tools to evaluate, select, design, test, manufacture, and operate parachute recovery systems. These systems range from simple, one-parachute assemblies to multiple-parachute systems, and may include equipment for impact attenuation, flotation, location, retrieval, and disposition. All system aspects are discussed, including the need for parachute recovery, the selection of the most suitable recovery system concept, a computerized approach to parachute performance, force and stress analysis, geometric gore design, component layout, material

selection, system design, manufacturing, and in-service maintenance. GRA

N86-12211# Oregon State Univ., Corvallis. Dept. of Mechanical Engineering.
DEVELOPMENT OF AN ANALYTICAL MODEL AND CODE FOR THE FLAPPING RESPONSE OF A HAWTE ROTOR BLADE
R. W. Thresher and E. L. Hershberg Feb. 1985 233 p
(Contract DE-AC02-83CH-10093)
(DE85-008806; SERI/STR-217-2629) Avail: NTIS HC A11/MF A01

The following report is a descriptive summary of the work performed under RFP 76824 for Rockwell International's Rocky Flats, Colorado, facility as part of the Federal Wind Energy Research Program. The objectives of this project were threefold: (1) development of an analytical model of the flapping response of a wind turbine rotor; (2) development of an interactive, user-friendly computer code for performing the flapping analysis and for computing the rotor loads due to aerodynamic factors and blade flapping responses; and (3) verification of the model and the computer code with measured loads data taken from an existing machine. The model is a single-degree-of-freedom flapping response model of an individual wind turbine blade. It accounts for the blade bending deformation about the smallest blade inertia axis. The rotor is assumed to rotate at a constant speed, but the hub is allowed to move in a prescribed yawing motion. Rotors that are tilted and yawed relative to the mean wind direction can be accommodated in a straightforward manner. DOE

N86-12434# Joint Publications Research Service, Arlington, Va.
BLR STUDIES ON CONIC MODEL WITH LDA IN FL-1 WIND TUNNEL
Zhong Zhan and Yu Yong *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-034) 1 Oct. 1985 p 67-70 Transl. into ENGLISH from Guoji Hangkong (Beijing), no. 6, Jun. 1985 p 9-10 (For primary document see N86-12430 03-31)
Avail: NTIS HC A08/MF A01

N86-12659# Joint Publications Research Service, Arlington, Va.
INFLUENCE OF WATER VAPOR ON DISTRIBUTION OF TURBULENT WAVE PARAMETERS Abstract Only
N. N. Pilyugin and S. G. Tikhomirov *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 26-27 Transl. into ENGLISH from Mekhan. Zhidkosti i Gaza (Moscow), no. 1, Jan. - Feb. 1985 p 138-142 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

03 AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; and aircraft accidents.

For related information see also *16 Space Transportation* and *85 Urban Technology and Transportation.*

N86-12212*# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
AN ANALYSIS OF THE APPLICATION OF AI TO THE DEVELOPMENT OF INTELLIGENT AIDS FOR FLIGHT CREW TASKS
Sheldon Baron and Carl Feehrer Washington NASA Oct. 1985 114 p refs
(Contract NAS1-17335)
(NASA-CR-3944; NAS 1.26:3944) Avail: NTIS HC A06/MF A01 CSCL 05H

This report presents the results of a study aimed at developing a basis for applying artificial intelligence to the flight deck environment of commercial transport aircraft. In particular, the study was comprised of four tasks: (1) analysis of flight crew tasks, (2) survey of the state-of-the-art of relevant artificial intelligence areas, (3) identification of human factors issues relevant to intelligent cockpit aids, and (4) identification of artificial intelligence areas requiring further research. Author

N86-12213# Naval Air Development Center, Warminster, Pa. Aircraft and Crew Systems Technology Directorate.
G PROTECTION BY AN EXTREME CROUCH POSITION Phase Report, 1 Aug. 1983 - 1 Sep. 1984
H. J. VONBeckh 4 Sep. 1984 14 p
(NR Proj. F58-523)
(AD-A157081; NADC-84162-60) Avail: NTIS HC A02/MF A01 CSCL 06/19

In World War II the pilots of diving bombers tolerated high G loads by assuming a crouch position. The Dynamic Flight Simulator (Human Centrifuge) was used to prove the advantages of the crouch position. Two subjects were located in an extreme crouch position, the upper spine being at an angle of 80 to 90 degrees from the vertical. They tolerated 6.5 and 7.5 G respectively. Both subjects have tolerated only 3.5 G in former experiments when seated upright. The use of an Anti-G suit did not improve further G tolerance. Both subjects abandoned the experiment not because of the Loss of Vision, but because of the discomfort of overfilling of the facial area with blood. It is planned to find a crouch position where the vision is still maintained and the blood filling of the facial area is mitigated. This would probably be a crouch position of 45 to 60 degrees from the vertical. Author (GRA)

N86-12214# Federal Aviation Agency, Atlantic City, N.J.
AIRCRAFT INTERIOR PANEL TEST CRITERIA DERIVED FROM FULL-SCALE FIRE TESTS Final Report
R. G. Hill, T. I. Eklund, and C. P. Sarkos Sep. 1985 65 p refs Original contains color illustrations
(FAA/CT-85/23) Avail: NTIS HC A04/MF A01

Full scale cabin fire tests were conducted to determine potential increases in passenger survivability associated with different interior honeycomb panel constructions. The test fuselage was a C-133 with a simulated wide body door opening exposed to an 8 foot by 10 foot fuel fire. In the first series, the interior near the door was lined with the honeycomb panels to determine whether earlier studies performed with small scale enclosures were consistent with the full scale counterpart. These earlier studies resulted in the selection of the Ohio State University (OSU) Rate of Heat Release Apparatus as the most appropriate type test to evaluate aircraft panels. The first series was followed by tests that included fire blocked seats and carpeting as well as the panels to determine the type survivability increases that could be attained from low heat release materials. The scenario employed generally resulted with flashover within 2 minutes for panels considered typical in performance. A low heat release phenolic/fiberglass panel demonstrated a flashover delay until about 4 minutes into the test. An incombustible panel prevented flashover altogether. The performance of the various panels was evaluated to develop recommended flammability criteria for a modified OSU Rate of Heat Release Apparatus. Author

N86-12215# General Accounting Office, Washington, D. C. Resources Community and Economic Development Div.
FAA (FEDERAL AVIATION ADMINISTRATION) COULD IMPROVE OVERALL AVIATION SAFETY AND REDUCE COSTS ASSOCIATED WITH AIRPORT INSTRUMENT LANDING SYSTEMS
3 Apr. 1985 50 p
(PB85-195444; GAO/RCED-85-24; B-215115) Avail: NTIS HC A03/MF A01 CSCL 01E

The Federal Aviation Administration (FAA) operates and maintains over 700 instrument landing systems at airports throughout the United States. The Government Accounting Office (GAO) found that FAA could save about $31 million between now and the year 2000 if it replaced some of its older instrument landing systems with newer systems, which are less costly to operate. GAO also found that FAA could improve overall aviation safety and reduce cost by ensuring that existing systems are located where they are needed most. GRA

04 AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

For related information see also *17 Spacecraft Communications, Command, and Tracking* and *32 Communications.*

N86-12216*# Ohio State Univ., Columbus. ElectroScience Lab.
SIMULATION OF THE ENHANCED TRAFFIC ALERT AND COLLISION AVOIDANCE SYSTEM (TCAS 2) Semiannual Report
Roberto G. Rojas, Walter D. Burnside, Philip Law, and Brett Grandchamp Sep. 1985 86 p refs
(Grant NsG-1498)
(NASA-CR-176328; NAS 1.26:176328; SAR-716199-3) Avail: NTIS HC A05/MF A01 CSCL 17G

The OSU aircraft code is used to analyze and simulate the TCAS 2 circular array which is mounted on the fuselage of a Boeing 737 aircraft. It is shown that the sum and difference patterns radiated by the circular array are distorted by the various structures of the aircraft, i.e., wings, tail, etc. Furthermore, monopulse curves are calculated and plotted for several beam positions and THETA angles. As expected, the worst cases of distortion occur when the beams are pointed toward the tail of the aircraft. Author

N86-12425# Joint Publications Research Service, Arlington, Va.
NEW DUAL Z80 NAVIGAITON COMPUTER DESCRIBED
Yu Shiquan, Zhang Chunbao, and Wu Shuwei *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-021) 8 Jul. 1985 p 113-122 refs Transl. into ENGLISH from Dianzi Jishu (Shanghai), v. 12, no. 1, 12 Jan. 1985 p 5-8 (For primary document see N86-12421 03-31)
Avail: NTIS HC A09/MF A01

05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes aircraft simulation technology.

For related information see also *18 Spacecraft Design, Testing and Performance* and *39 Structural Mechanics.*

N86-12217 Department of the Air Force, Washington, D.C.
PNEUMATIC ACTUATOR DEVICE Patent
R. W. Gazzera, inventor (to Air Force) Issued 16 Apr. 1985 7 p Supersedes AD-D009822
(AD-D011794; US-Patent-4,510,846; US-Patent-Class-91-460) Avail: US Patent and Trademark Office CSCL 13/11

A closed center four-way poppet actuator control device is incorporated into a pneumatic actuation system for controlling the movement of flight surfaces. The closed center four-way poppet actuator control device has a housing, a pair of two-way poppet valves in the housing, a rocker arm assembly mounted on the housing and connected to the pair of two-way poppet valves, and a diaphragm assembly also mounted in the housing and in contact with the two-way valves. A torque motor-driver assembly connected to the diaphragm assembly actuates the two-way valves as determined by control symbols. The rocker arm causes the two-way valves to function opposite each other: one allows high pressure gas to be input to a lobe motor acutator while the other allows gas to be output from the lobe motor actuator. Each two-way valve has a cylindrical poppet valve for inletting the gas to the actuator and a disk poppet valve for outputting the gas from the actuator to a vent. The actuator causes movement of the flight surfaces through a gearbox. A velocity transducer monitors this movement and transmits this movement to an electronic control unit which sends control signals to drive the torque motor-driver assembly that actuates said actuator control device. Author (GRA)

N86-12218*# Integrated Systems, Inc., Palo Alto, Calif.
REAL-TIME FLUTTER IDENTIFICATION Final Report
Richard Roy and Robert Walker Washington NASA Oct. 1985 147 p refs
(Contract NAS2-11451)
(NASA-CR-3933; NAS 1.26:3933; ISI-48) Avail: NTIS HC A07/MF A01 CSCL 01C

The techniques and a FORTRAN 77 MOdal Parameter IDentification (MOPID) computer program developed for identification of the frequencies and damping ratios of multiple flutter modes in real time are documented. Physically meaningful model parameterization was combined with state of the art recursive identification techniques and applied to the problem of real time flutter mode monitoring. The performance of the algorithm in terms of convergence speed and parameter estimation error is demonstrated for several simulated data cases, and the results of actual flight data analysis from two different vehicles are presented. It is indicated that the algorithm is capable of real time monitoring of aircraft flutter characteristics with a high degree of reliability. E.A.K.

N86-12219# Army War Coll., Carlisle Barracks, Pa.
THE C-17: WE NEED IT YESTERDAY
B. R. Hooten 25 Apr. 1985 37 p
(AD-A157147) Avail: NTIS HC A03/MF A01 CSCL 01/3

This student essay examines the historical development of the C-17, beginning in the 1970's when Tactical Airlift Command was pressing for development of the Advanced Medium Shortfield Takeoff and Landing Transport. An in-depth look is taken at the Congressionally Mandated Mobility Study and at the analyses done by the C-X Task Force that led to the final definition of the C-17. The US Air Force Airlift Master Plan is reviewed to show the importance of the C-17 to the structure of our airlift force of the future. Real world potential applications of the C-17 are projected by examination of two studies of actual airlift operations. AHUAS TARA '83, (a combined operation in Honduras) and URGENT FURY, the US rescue mission to Grenada in October 1983. This essay supports the need to buy the C-17 by showing the detailed, logistical process that led to its design, and by using two recent actual operations to show the airplane's unprecedented airlift capabilities of today and into the foreseeable future. GRA

N86-12450# Joint Publications Research Service, Arlington, Va.
WINGTIP SAILS TESTED ON Y-5 AIRCRAFT
Yang Daxi *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-029) 3 Sep. 1985 p 49-53 Transl. into ENGLISH from Guoji Hangkong (Beijing), no. 5, May 1985 p 2-3 (For primary document see N86-12446 03-31)
Avail: NTIS HC A08/MF A01

06 AIRCRAFT INSTRUMENTATION

Includes cockpit and cabin display devices; and flight instruments.

For related information see also *19 Spacecraft Instrumentation* and *35 Instrumentation and Photography.*

N86-12220*# Dayton Univ., Ohio.
PERFORMANCE OF AN ALPHA-VANE AND PITOT TUBE IN SIMULATED HEAVY RAIN ENVIRONMENT Final Report
James K. Luers and Ira B. Fiscus Oct. 1985 32 p ref
(Grant NAG1-522)
(NASA-CR-176353; NAS 1.26:176353; UDR-TR-85-131) Avail: NTIS HC A03/MF A01 CSCL 01D

Experimental tests were conducted in the UDRI Environmental Wind/Rain Tunnel to establish the performance of an alpha-vane, that measures angle of attack, in a simulated heavy rain environment. The tests consisted of emersing the alpha-vane in an airstream with a concurrent water spray penetrating vertically through the airstream. The direction of the spray was varied to make an angle of 5.8 to 18 deg with the airstream direction in order to simulate the conditions that occur when an aircraft lands

in a heavy rain environment. Rainrates simulated varied from 1000 to 1200 mm/hr which are the most severe ever expected to be encountered by an aircraft over even a 30 second period. Tunnel airspeeds ranged from 85 to 125 miles per hour. The results showed that even the most severe rainrates produced a misalignment in the alpha-vane of only 1 deg away from the airstream direction. Thus for normal rain conditions experienced by landing aircraft no significant deterioration in alpha-vane performance is expected. B.W.

N86-12221# Air Force Flight Test Center, Edwards AFB, Calif.
T-33 (SILVER STAR MK 3) PITOT-STATIC SYSTEM CALIBRATION Final Report, 17 Apr. - 15 May 1985
T. R. Woodford and E. P. Hansen Jun. 1985 34 p
(AD-A157854; AFFTC-TR-85-19) Avail: NTIS HC A03/MF A01 CSCL 01/4

This report presents the results of pitot-static system calibration tests performed on T-33 (Silver Star MK 3), civil registration number N83TB. The T-33 pitot-static system was calibrated in order to use the T-33 as a pacer for the T-46A pitot-static system calibration tests to be performed during the T-46A Development Test and Evaluation Program. Although the test aircraft will perform satisfactorily as a pacer, periodic checks on the pitot-static system's accuracy should be performed. GRA

N86-12222# Sanders Associates, Inc., Nashua, N. H.
ADVANCED AVIONICS COMPUTER ARCHITECTURE. VOLUME 1. EXECUTIVE SUMMARY Final Report, May 1980 - Nov. 1984
L. Greenspan and R. Singletary May 1985 19 p
(Contract F33615-79-C-1935)
(AD-A158119; AFWAL-TR-85-1041-Vol-1) Avail: NTIS HC A02/MF A01 CSCL 09/2

This exploratory development program was originally aimed at developing a computer with features to specifically support the JOVIAL (J73) programming language with considerations to Ada. Later, the program was redirected to modify the instruction set architecture (ISA) to more fully support Ada and increase performance. The new ISA supports most of the standard functions found in most ISA, but gives additional supports in: the Ada package concept, processing arrays and records, unconstrained arrays, dynamic storage allocation, detecting dangling references, detecting undefined variables, Ada-like exception handling, case instructions, for-loop instructions, Ada-like parameter passing, Ada-like tasking instructions and IEEE-standard floating point data types. GRA

N86-12223# Sanders Associates, Inc., Nashua, N. H.
ADVANCED AVIONICS COMPUTER ARCHITECTURE. VOLUME 2. INSTRUCTION SET ARCHITECTURE SPECIFICATION Final Report, May 1980 - Nov. 1984
L. Greenspan and R. Singletary May 1985 305 p 2 Vol.
(Contract F33615-79-C-1935)
(AD-A158120; AFWAL-TR-85-1041-Vol-2) Avail: NTIS HC A14/MF A01 CSCL 09/2

This exploratory development program was originally aimed at developing a computer with features to specifically support the JOVIAL (J73) programming language with considerations to Ada. Later, the program was redirected to modify the instruction set architecture (ISA) to more fully support Ada and increase performance. The new ISA supports most of the standard functions found in most ISA, but gives additional supports in: the Ada package concept, processing arrays and records, unconstrained arrays, dynamic storage allocation, detecting dangling reference, detecting undefined variables, Ada-like exception handling, case instructions, for-loop instructions, Ada-like parameter passing, Ada-like tasking instructions and IEEE-standard floating point data types. GRA

N86-12224# General Accounting Office, Washington, D. C. National Security and International Affairs Div.
NAVY SHOULD JOIN THE AIR FORCE AND ARMY PROGRAM TO DEVELOP AN ADVANCED INTEGRATED AVIONICS SYSTEM
17 Jun. 1985 17 p
(PB85-222503; GAO/NSIAD-85-94; B-215379) Avail: NTIS HC A02/MF A01 CSCL 01D

Modern technology should soon enable separate avionics systems in an aircraft to be consolidated into a single package to conserve space, save weight, and reduce costs. The report points out the potential benefits of avionics consolidation and recommends the Navy join in a demonstration program now being conducted by the Air Force and Army to exploit such benefits. GRA

07 AIRCRAFT PROPULSION AND POWER

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and on-board auxiliary power plants for aircraft.

For related information see also *20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

N86-12225 Department of the Air Force, Washington, D.C.
COMPARTMENTED, FILAMENT WOUND, ONE-PIECE AIRCRAFT FUEL TANKS Patent
E. J. Morrisey, inventor (to Air Force) Issued 16 Apr. 1985 6 p
(AD-D011793; US-Patent-4,511,105; US-Patent-Class-244-135)
Avail: US Patent and Trademark Office CSCL 01/3

An external aircraft fuel tank is provided which comprises a filament-reinforced fuel cell assembled with aerodynamic end shapes having a plurality of layers of adhesive resin-impregnated filament wrappings over the assembly. Also provided is a method for making the fuel tank. Author (GRA)

N86-12226*# Pratt and Whitney Aircraft Group, East Hartford, Conn. Engineering Div.
TURBINE BLADE AND VANE HEAT FLUX SENSOR DEVELOPMENT, PHASE 2 Final Report, Sep. 1982 - Jul. 1985
W. H. Atkinson, M. A. Cyr, and R. R. Strange Oct. 1985 85 p refs
(Contract NAS3-23629)
(NASA-CR-174995; NAS 1.26:174995; PWS-5914-39) Avail: NTIS HC A05/MF A01 CSCL 21E

The development of heat flux sensors for gas turbine blades and vanes and the demonstration of heat transfer measurement methods are reported. The performance of the heat flux sensors was evaluated in a cylinder in cross flow experiment and compared with two other heat flux measurement methods, the slug calorimeter and a dynamic method based on fluctuating gas and surface temperature. Two cylinders, each instrumented with an embedded thermocouple sensor, a Gardon gauge, and a slug calorimeter, were fabricated. Each sensor type was calibrated using a quartz lamp bank facility. The instrumented cylinders were then tested in an atmospheric pressure combustor rig at conditions up to gas stream temperatures of 1700K and velocities to Mach 0.74. The test data are compared to other measurements and analytical prediction. E.A.K.

N86-12227*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
FLUID MACHINES: EXPANDING THE LIMITS, PAST AND FUTURE
Melvin J. Hartmann and Donald M. Sandercock 1985 46 p refs
Presented at the Winter Ann. Meeting of the Am. Soc. of Mech. Eng., Miami Beach, Fla., 17-22 Nov. 1985
(NASA-TM-87161; E-2793; NAS 1.15:87161) Avail: NTIS HC A03/MF A01 CSCL 21E

During the 40 yr period from 1940 to 1980, the capabilities and operating limits of fluid machines were greatly extended. This was due to a research program, carried out to meet the needs of aerospace programs. Some of the events are reviewed. Overall advancements of all machinery components are discussed followed by a detailed examination of technology advancements in axial

compressors and pumps. Future technology needs are suggested. E.A.K.

N86-12228# Department of the Air Force, Washington, D.C.
IMPROVED TEMPERATURE DETECTION SYSTEM FOR USE ON FILM COOLED TURBINE AIRFOILS Patent Application
R. Frederick, inventor (to Air Force) Filed 1 May 1985 13 p
(AD-D011762; US-Patent-Appl-SN-729388) Avail: NTIS HC A02/MF A01 CSCL 21/5

This patent application discloses an improved temperature detection system for use on film cooled turbine airfoils having a showerhead assembly with a series of parallel slots defined in the leading edge of an airfoil, each slot having a multiplicity of film flow ports exiting therefrom. A plurality of sensor assemblies are affixed to the airfoil showerhead and are couplable via electrodes to electronic sensing equipment for establishing the gas flow temperature. GRA

N86-12229# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio.
COMPRESSOR RESEARCH FACILITY F100 HIGH PRESSURE COMPRESSOR INLET TOTAL PRESSURE AND SWIRL PROFILE SIMULATION Final Report, Dec. 1980 - Nov. 1983
W. W. Copenhaver Oct. 1984 287 p
(AF Proj. 3066)
(AD-A157108; AFWAL-TR-84-2030) Avail: NTIS HC A13/MF A01 CSCL 21/5

The F100 gas turbine engine currently powers the Air Force F-15 and F-16 aircraft. The compression section of this engine consists of a three-stage fan followed by a ten-stage High Pressure Compressor (HPC). A component test of the F100 HPC will be performed in the Compressor Research Facility (CRF) of the Aero Propulsion Laboratory (APL) at Wright-Patterson Air Force Base, to investigate its stall and post stall characteristics. This testing will require that the high pressure compressor entrance profiles be simulated to obtain results which correspond to actual engine operation. Since these entrance profiles had never been measured, a program was designed to experimentally measure the total and static pressure, temperature and flow angle profiles at the HPC entrance of an F100 Series 3 engine (F100 (3)), (S/NP072). The measured profile data were then used as design data for a set of inlet screens and vanes. These vanes and screens will simulate the engine fan discharge profiles for the HPC test. The manufactured screens and vanes were tested in Room 24 of Building 18 of the Air Force Wright Aeronautical Laboratories to verify their simulation capabilities. Five separate test periods were necessary to achieve the program goals. These tests are described in Sections 2 thru VI. The program discussion and conclusions are presented in Section 7 and 8. GRA

N86-12230# Battelle Columbus Labs., Ohio.
COMPOSITION AND PHOTOCHEMICAL REACTIVITY OF TURBINE ENGINE EXHAUST Final Report, Mar. 1983 - Sep. 1984
C. W. Spicer, M. W. Holdren, F. F. Lyon, and R. M. Riggin Jun. 1985 52 p
(Contract F08635-82-C-0131)
(AD-A157643; AFESC/ESL-TR-84-61) Avail: NTIS HC A04/MF A01 CSCL 21/2

This study was carried out to augment the results of an earlier investigation of turbine engine emissions. Experiments were conducted to investigate the photochemical reactivity and biological activity of exhaust from a full-scale 60 deg. sector combustor from a TF-39 turbine engine. All experiments were carried out at idle power setting. The study utilized exhaust from two conventional petroleum fuels (JP-4 and JP-5) and a shale fuel meeting JP-4 specifications. Photochemical reactivity was studied with two large (8 cum 3)n Teflon outdoor environmental chambers. Photochemical reactivity is defined for purposes of this study as the maximum ozone concentration produced during a one day irradiation in natural sunlight. Experiments were undertaken with a TF-39 combustor operating on JP-4 and JP-5 fuels, for comparison with pervious studies of a full-scale TF-39 engine. The combustor exhaust was more effective than exhaust from the full-scale engine, regardless of which fuel was burned. The combustor exhaust was 60 percent more reactive than engine exhaust for JP-5 fuel, and between 30 and 100 percent more reactive for JP-4 fuel. The photochemical reactivity of exhaust generated from a shale oil-derived fuel meeting JP-4 specifications was studied. Exhaust from the shale fuel was no more reactive than exhaust from petroleum fuels, and under some circumstances was actually less reactive. The shale fuel exhaust also generated less secondary aerosol than exhaust from the petroleum fuels. GRA

N86-12231# Naval Weapons Center, China Lake, Calif.
ANALYSIS OF PARTICULATES IN THE EXHAUST PLUME OF A J52-P3 TURBOJET ENGINE AT MILITARY POWER Interim Report, Oct. 1983 - Sep. 1984
J. H. Johnson, E. D. Erickson, and D. J. Knight Mar. 1985 27 p
(AD-A157840; AD-E900455; NWC-TP-6618) Avail: NTIS HC A03/MF A01 CSCL 21/5

This report presents particulate concentration, emission index, and size distribution data in the exhaust plume of a J52-P3 turbojet engine, run at military power in the open air. Recommendations are listed for future tests. GRA

N86-12232# Department of the Air Force, Washington, D.C.
LENGTH ADJUSTABLE STRUT LINK WITH LOW AERODYNAMIC DRAG Patent Application
D. Nash, inventor (to Air Force) Filed 10 Jul. 1985 25 p
(AD-D011851; US-Patent-Appl-SN-753462) Avail: NTIS HC A02/MF A01 CSCL 13/5

This patent application discloses a low aerodynamic drag structural link suitable for use within the housing of a turbofan jet engine. The link includes length adjustment capability, pivotal end mounting provision, maintained airstream orientation capability, low mass and jam nut length and orientation locking. Several variations in link construction including a single ball and socket arrangement, varying link cross-section along its longitudinal length and the use of fairing nose and tail inserts are disclosed. GRA

08 AIRCRAFT STABILITY AND CONTROL

Includes aircraft handling qualities; piloting; flight controls; and autopilots.

N86-12233*# Purdue Univ., West Lafayette, Ind. School of Aeronautics and Astronautics.
INTERACTIVE AIRCRAFT FLIGHT CONTROL AND AEROELASTIC STABILIZATION Semiannual Report, 1 May - 31 Oct. 1985
Terrence A. Weisshaar Nov. 1985 48 p refs
(Grant NAG1-157)
(NASA-CR-176323; NAS 1.26:176323) Avail: NTIS HC A03/MF A01 CSCL 01C

Aeroservoelastic optimization techniques were studied to determine a methodology for maximization of the stable flight envelope of an idealized, actively controlled, flexible airfoil. The equations of motion for the airfoil were developed in state-space form to include time-domain representations of aerodynamic forces and active control. The development of an optimization scheme to stabilize the aeroelastic system over a range of airspeeds, including the design airspeed is outlined. The solution approach was divided in two levels: (1) the airfoil structure, with a design variable represented by the shear center position; and (2) the control system. An objective was stated in mathematical form and a search was conducted with the restriction that each subsystem be constrained to be optimal in some sense. Analytical expressions are developed to compute the changes in the eigenvalues of the closed-loop, actively controlled system. A stability index is constructed to ensure that stability is present at the design speed and at other airspeeds away from the design speed. E.A.K.

N86-12234# Aeronautical Research Labs., Melbourne (Australia).
FLUTTER CLEARANCE TESTS ON A TRANSAVIA PL-12/T-400 SKYFARMER
A. Goldman and S. Galea Mar. 1985 66 p
(AD-A157212; ARL/STRUC-TM-400) Avail: NTIS HC A04/MF A01 CSCL 20/4

The Transavia T-400 Skyfarmer is the latest version of the twin-boom agricultural aircraft and incorporates several changes from the T-300 model previously tested. Changes which could affect the flutter characteristics are: (1) Change of engine from 6 cylinder 300 horsepower to 8 cylinder 400 horsepower; (2) Increase in length of tail booms by 750 mm; (3) Increase in stub-wing span by 900 mm; (4) Removal of the spring-tab from the elevators; and (5) Addition of a dorsal stabilizer fin along each tail boom. A ground resonance test and subsequent flight tests were conducted on a Transavia T-400 Skyfarmer. The natural modes and frequencies of vibration were measured in the ground tests, and monitored during flight tests in which attempts were made to induce flutter. The results of these tests are presented. GRA

N86-12235# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio.
POST STALL MANEUVERS AND THRUST VECTORING PERFORMANCE ANALYSIS Final Technical Report, Aug. 1983 - Jul. 1984
L. E. Miller Jul. 1984 77 p
(AF Proj. 2404)
(AD-A158100; AFWAL-TR-84-3109) Avail: NTIS HC A05/MF A01 CSCL 01/2

The purpose of this effort was to determine whether or not there are any apparent performance improvements through post stall maneuvers (PSM) or thrust vectoring. The PSM is a result of high angles of attack, greater than the stall value. Two different problems were addressed. The first examined instantaneous turning performance. The second focused on minimum time turn problems. The impact of both vectored and nonvectored thrust was considered. It was proven that minimum time turns fall in the vertical plane. For maximum instantaneous turning rate and nonvectored thrust high angle of attack results if the speed is less than the critical speed which is approximately Mach 0.2. The optimal angle of attack approaches 90 deg as the speed approaches zero. For vectored thrust, the stall angle of attack is optimum and the thrust vector angle is the complement of the angle of attack. The PSM is not optimal if thrust vectoring is available. For minimum time turning performance, maximum thrust is optimal. At the end of the trajectory, the optimal angle of attack equals that for maximum instantaneous performance. The PSM is optimal. As the thrust to weight ratio increases, the maximum angle of attack increases. GRA

N86-12236# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
AN APPLICATION OF ADAPTIVE LEARNING TO MALFUNCTION RECOVERY M.S. Thesis
R. E. Cruz 1985 51 p
(AD-A158129; AFIT/CI/NR-85-85T) Avail: NTIS HC A04/MF A01 CSCL 01/4

A self-organizing controller was developed for a simplified two-dimensional aircraft model. The controller learns how to pilot the aircraft through a navigational mission without exceeding pre-established position and velocity limits. The controller pilots the aircraft by activating one of eight directional actuators at all times. By continually monitoring the aircraft's position and velocity with respect to the mission, the controller progressively modifies its decision rules to improve the aircraft's performance. When the controller has learned how to pilot the aircraft, two actuators fail permanently. Despite this malfunction, the controller regains proficiency at its original task. The experimental results reported show the controller's capabilities for self-organizing control, learning, and malfunction recovery. GRA

N86-12405# Joint Publications Research Service, Arlington, Va.
JAPANESE REPORT ON CHINA'S F-8 FIGHTER
Yu Yuebo *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-035) 17 Oct. 1985 p 70-72 Transl. into ENGLISH from Hangkong Zhishi (Beijing), no. 7, Jul. 1985 p 22-23 (For primary document see N86-12399 03-31)
Avail: NTIS HC A08/MF A01

09 RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tube facilities; and engine test blocks.

For related information see also *14 Ground Support Systems and Facilities (Space).*

N86-12237*# College of William and Mary, Williamsburg, Va. Dept. of Computer Science.
USER'S GUIDE TO STIPPAN: A PANEL METHOD PROGRAM FOR SLOTTED TUNNEL INTERFERENCE PREDICTION Report, 16 Mar. - 15 Jun. 1985
William B. Kemp, Jr. 5 Nov. 1985 33 p refs
(Contract NCC1-69)
(NASA-CR-178003; NAS 1.26:178003) Avail: NTIS HC A03/MF A01 CSCL 14B

Guidelines are presented for use of the computer program STIPPAN to simulate the subsonic flow in a slotted wind tunnel test section with a known model disturbance. Input data requirements are defined in detail and other aspects of the program usage are discussed in more general terms. The program is written for use in a CDC CYBER 200 class vector processing system. Author

N86-12238*# Vigyan Research Associates, Inc., Hampton, Va. Dept. of Aeronautics and Astronautics.
INTRODUCTION TO CRYOGENIC WIND TUNNELS
Michael J. Goodyer (Southampton Univ.) Sep. 1985 14 p refs
(Contract NAS1-17919)
(NASA-CR-177966; NAS 1.26:177966; AGARD-722-Paper-1) Avail: NTIS HC A02/MF A01 CSCL 14B

The background to the evolution of the cryogenic wind tunnel is outlined, with particular reference to the late 60's/early 70's when efforts were begun to re-equip with larger wind tunnels. The problems of providing full scale Reynolds numbers in transonic testing were proving particularly intractible, when the notion of satisfying the needs with the cryogenic tunnel was proposed, and then adopted. The principles and advantages of the cryogenic tunnel are outlined, along with guidance on the coolant needs when this is liquid nitrogen, and with a note on energy recovery. Operational features of the tunnels are introduced with reference to a small low speed tunnel. Finally the outstanding contributions are highlighted of the 0.3-Meter Transonic Cryogenic Tunnel (TCT) at NASA Langley Research Center, and its personnel, to the furtherance of knowledge and confidence in the concept. Author

N86-12239*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
WIND TUNNEL TURNING VANES OF MODERN DESIGN
T. F. Gelder, R. D. Moore, J. M. Sanz, and E. R. McFarland [1985] 23 p refs Proposed for presentation at the 24th Aerospace Sci. Meeting, Reno, Nev., 6-8 Jan. 1986; sponsored by AIAA
(NASA-TM-87416; E-2775; NAS 1.15:87416; AIAA-86-0044) Avail: NTIS HC A02/MF A01 CSCL 14B

Rehabilitation of the Altitude Wind Tunnel includes the need for new corner turning vanes to match its upgraded performance. The design and experimental performance results from a 0.1-full scale model of the highest speed corner (M = 0.35) are presented and discussed along with some two dimensional inviscid analyses of two vaned corners. With a vane designed by an inverse two dimensional technique, the overall corner loss was about 12% of the inlet dynamic pressure of which about 4% was caused by vane skin friction. Comparable values with a conventionally

designed circular arc vane were about 14% overall with about 7% due to skin friction. E.A.K.

N86-12240*# College of William and Mary, Williamsburg, Va.
WALL-INTERFERENCE ASSESSMENT IN THREE-DIMENSIONAL SLOTTED-WALL WIND TUNNELS Final Technical Report, 16 Jun. 1982 - 15 Oct. 1985
William B. Kemp, Jr. [Oct. 1985] 11 p refs
(NCC1-69)
(NASA-CR-176320; NAS 1.26:176320) Avail: NTIS HC A02/MF A01 CSCL 14B

The development of the slotted tunnel simulator code and lessons learned from its use are summarized. The high order panel method was selected as the basic procedure for aerodynamic computations. The panel singularities are supplemented by line sources to represent discrete wall slots. G.L.C.

N86-12241# Federal Aviation Administration, Washington, D.C. Associate Administrator for Airports.
REPORT OF ACCOMPLISHMENTS UNDER THE AIRPORT IMPROVEMENT PROGRAM Annual Report, period ending 30 Sep. 1984
V. J. Martin 30 Sep. 1984 125 p
(AD-A156834; AD-E301723; FAA-ARP-85-1; FAA-ARP-11; AR-3)
Avail: NTIS HC A06/MF A01 CSCL 01/5

Section 521 of the Airport and Airway Improvement Act of 1982 (Public Law 97-248) requires that the Secretary of Transportation submit an annual report to Congress describing the accomplishments of the airport grant program. This report covers activities for the fiscal year ending September 30, 1984. Author (GRA)

N86-12242# Florida Univ., Gainesville. Dept. of Civil Engineering.
CBR (CALIFORNIA BEARING RATIO) DESIGN OF FLEXIBLE AIRFIELD PAVEMENTS WITH CASE STUDY M.S. Thesis
T. M. Destafney 1985 94 p
(Contract N66314-72-A-3029)
(AD-A158101) Avail: NTIS HC A05/MF A01 CSCL 13/2

It is the purpose of this paper to state the fundamentals involved in the design of flexible airfield pavements utilizing the U.S. Army Corps of Engineers CBR (California Bearing Ratio) design method. This paper also discusses concepts that are considered to be prerequisites to any discussion of the subject, including basic pavement theory, aircraft loading effects, subgrade strength, and aircraft characteristics related to design. The CBR method of design is outlined, and an actual design performed in order to more clearly illustrate this method of designing flexible airfield pavements. GRA

12 ASTRONAUTICS (GENERAL)

For extraterrestrial exploration see *91 Lunar and Planetary Exploration.*

N86-12243*# ECON, Inc., Alexandria, Va.
MARKETING THE USE OF THE SPACE ENVIRONMENT FOR THE PROCESSING OF BIOLOGICAL AND PHARMACEUTICAL MATERIALS Final Report
13 Apr. 1984 162 p refs
(Contract NASw-3339)
(NASA-CR-176334; NAS 1.26:176334; ECON-81-110) Avail: NTIS HC A08/MF A01 CSCL 22A

The perceptions of U.S. biotechnology and pharmaceutical companies concerning the potential use of the space environment for the processing of biological substances was examined. Physical phenomena that may be important in space-base processing of biological materials are identified and discussed in the context of past and current experiment programs. The capabilities of NASA to support future research and development, and to engage in cooperative risk sharing programs with industry are discussed. Meetings were held with several biotechnology and pharmaceutical companies to provide data for an analysis of the attitudes and perceptions of these industries toward the use of the space environment. Recommendations are made for actions that might be taken by NASA to facilitate the marketing of the use of the space environment, and in particular the Space Shuttle, to the biotechnology and pharmaceutical industries. Author

13 ASTRODYNAMICS

Includes powered and free-flight trajectories; and orbit and launching dynamics.

N86-12396# Joint Publications Research Service, Arlington, Va.
MEAN DENSITY SCALE HEIGHTS FROM ANALYSIS OF VARIATION IN PERIGEE HEIGHT OF CHINA'S SECOND SATELLITE
Feng Zhanliang *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-016) 23 May 1985 p 67-72 refs Transl. into ENGLISH from Kongjian Kexue Xuebao (Beijing), v. 4, no. 1, 1984 p 76-81 Original language document was announced in IAA as A86-45634 (For primary document see N86-12393 03-31)
Avail: NTIS HC A08/MF A01

N86-12881*# Texas Univ., Austin. Center for Space Research.
ON THE GEOGRAPHICAL CORRELATION OF ORBIT ERROR Abstract Only
B. D. Tapley and G. W. Rosborough *In* NASA, Washington Geopotential Res. Mission (GRM) Oct. 1985 p 76 (For primary document see N86-12852 03-46)
Avail: NTIS HC A07/MF A01 CSCL 22C

14 GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE)

Includes launch complexes, research and production facilities; ground support equipment, e.g., mobile transporters; and simulators.

For related information see also *09 Research Support Facilities (Air).*

N86-12244# Sandia National Labs., Albuquerque, N. Mex.
RIIM ACCELERATOR BEAM EXPERIMENTS
M. G. Mazarakis, D. L. Smith, R. B. Miller, R. S. Clark, D. E. Hasti, D. L. Johnson, J. W. Poukey, K. R. Prestwich, S. I. Shope, and R. D. Richardson 1985 13 p Presented at the Particle Accelerator Conf., Vancouver, British Columbia, 13 May 1985 Prepared in cooperation with Science Applications International Corp., Albuquerque, N. Mex.
(Contract DE-AC04-76DP-00789)
(DE85-012034; SAND-85-0057C; CONF-850504-38) Avail: NTIS HC A02/MF A01

A pulsed linear accelerator assembly, RIIM 9RADLAC II Module), composed of an injector plus a number of post accelerating gaps was built and successfully operated. The injector and the post accelerating gaps were powered by water trip pulse forming and transmission lines. A high-current, high-voltage, foilless diode injector was used and an annular 40-kA relativistic electron beam was produced and further accelerated through the post accelerating gaps. The final beam energy is close to the sum of injector and gap voltages and equal to 9 MeV. DOE

N86-12245# Sandia National Labs., Albuquerque, N. Mex.
PBFA-2 INSULATOR STACK DESIGN FROM AN ENGINEERING VIEWPOINT
L. O. Seamons 1985 5 p Presented at the 5th IEEE Pulsed Power Conf., Washington, D.C., 10 Jun. 1985
(Contract DE-AC04-76DP-00789)
(DE85-013437; SAND-84-2536C; CONF-850616-36) Avail: NTIS HC A02/MF A01

The mechanical design criteria and design solution for the 3.7 meter diameter PBFA-2 vacuum insulator stack were completed. The most fundamental decision was to design a modular

insulator stack interchangeable at both the module level and at the module component level. Furthermore, module physical symmetry was designed into the stack so that adjacent modules can be oriented anode-to-cathode or anode-to-anode without any module disassembly. This feature provides an easy way to reconfigure the accelerator for different voltages at the insulator stack. Dynamic response and structural stability for both static and shock loadings were identified as problem areas which required design solutions. The physical size and quality requirements of the insulator stack components were balanced against available vendor fabrication and production rate capabilities and against available Sandia assembly resources to decide the strategy to use for manufacture. DOE

15 LAUNCH VEHICLES AND SPACE VEHICLES

Includes boosters; manned orbital laboratories; reusable vehicles; and space stations.

No abstracts in this category.

16 SPACE TRANSPORTATION

Includes passenger and cargo space transportation, e.g., shuttle operations; and rescue techniques.

For related information see also *03 Air Transportation and Safety* and *85 Urban Technology and Transportation.*

No abstracts in this category.

17 SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING

Includes telemetry; space communications networks; astronavigation; and radio blackout.

For related information see also *04 Aircraft Communications and Navigation* and *32 Communications.*

No abstracts in this category.

18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE

Includes spacecraft thermal and environmental control; and attitude control.

For life support systems see *54 Man/System Technology and Life Support.* For related information see also *05 Aircraft Design, Testing and Performance* and *39 Structural Mechanics.*

N86-12246*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
LIQUID DROPLET RADIATOR PROGRAM AT THE NASA LEWIS RESEARCH CENTER
Alden F. Presler, Carolyn E. Coles, Priscilla S. Diem-Kirsop, and K. Alan White, III [1985] 23 p refs Prepared for presentation at the 4th Thermophys. and Heat Transfer Conf., Boston, 2-4 Jun. 1986; sponsored by AIAA and ASME
(NASA-TM-87139; E-2745; NAS 1.15:87139) Avail: NTIS HC A02/MF A01 CSCL 20D

The NASA Lewis Research Center and the Air Force Rocket Propulsion Laboratory (AFRPL) are jointly engaged in a program for technical assessment of the Liquid Droplet Radiator (LDR) concept as an advanced high performance heat ejection component for future space missions. NASA Lewis has responsibility for the technology needed for the droplet generator, for working fluid qualification, and for investigating the physics of droplets in space; NASA Lewis is also conducting systems/mission analyses for potential LDR applications with candidate space power systems. For the droplet generator technology task, both micro-orifice fabrication techniques and droplet stream formation processes have been experimentally investigated. High quality micro-orifices (to 50 micron diameter) are routinely fabricated with automated equipment. Droplet formation studies have established operating boundaries for the generation of controlled and uniform droplet streams. A test rig is currently being installed for the experimental verification, under simulated space conditions, of droplet radiation heat transfer performance analyses and the determination of the effect radiative emissivity of multiple droplet streams. Initial testing has begun in the NASA Lewis Zero-Gravity Facility for investigating droplet stream behavior in microgravity conditions. This includes the effect of orifice wetting on jet dynamics and droplet formation. Results for both Brayton and Stirling power cycles have identified favorable mass and size comparisons of the LDR with conventional radiator concepts. B.W.

N86-12247# RAND Corp., Santa Monica, Calif.
COMMERCIAL AND MILITARY COMMUNICATION SATELLITE ACQUISITION PRACTICES Interim Report
G. K. Smith, J. P. Stucker, and E. J. Simmons May 1985 131 p
(Contract F49620-82-C-0018)
(AD-A157398; RAND/R-3121-AF) Avail: NTIS HC A07/MF A01 CSCL 15/5

This study tests the contention that the commercial sector consistently manages acquisition programs better than the military, by examining management practices with program outcomes associated with the acquisition of communication satellites by the Air Force and by the International Telecommunications Satellite Organization (INTELSAT). The study finds that the military and commercial programs are organized and managed in much the same way and that both produce well-functioning, useful spacecraft. Several significant differences in management practices and outcomes, however, suggest that the Air Force may be able to improve its acquisition activities. It concludes that, in carefully selected situations, there should be a place for the performance-oriented INTELSAT management practices. Author (GRA)

N86-12248# Aerospace Corp., El Segundo, Calif. Lab. Operations.
THE AEROSPACE SPACECRAFT CHARGING DOCUMENT
A. L. Vampola, P. F. Mizera, H. C. Koons, J. F. Fennell, and D. F. Hall 3 Jun. 1985 52 p
(Contract F04701-83-C-0084)
(AD-A157664; TR-0084A(5940-05)-10; SD-TR-85-26) Avail: NTIS HC A04/MF A01 CSCL 22/1

This document presents basic information on spacecraft charging in the Earth's magnetosphere, documents principal results from the engineering experiments on the USAF P78-2 satellite which was flown as part of the joint USAF-NASA spacecraft charging program (SCATHA), and makes recommendations for methods for alleviating the deleterious effects of spacecraft charging. It is intended as a primer for spacecraft designers and spacecraft program managers. GRA

N86-12249# Los Alamos National Lab., N. Mex.
GROUND-BASED INVESTIGATIONS OF ATOMIC OXYGEN INTERACTIONS WITH SPACE STATION SURFACES
J. B. Cross, D. A. Cremers, and D. F. Tucker 1985 12 p Presented at the AIAA Thermophys. Conf., Williamsburg, Va., 18 Jun. 1985
(Contract W-7405-eng-36)
(DE85-014082; IA-UR-85-2220; CONF-850607-4) Avail: NTIS HC A02/MF A01

Ground-based simulation and testing facilities were developed to investigate atomic oxygen interactions with space station surfaces which include a high kinetic energy O-atom source, a sample exposure chamber and a high sensitivity molecular beam apparatus. The sample exposure chamber is suited for surveying materials for their O-atom reactivity through weight loss measurements. The high sensitivity molecular beam apparatus will be used to determine reaction mechanisms through measurements of reaction product identity, translational and internal state of products, and angular distribution of reaction products. The O-atom source, based on the use of a laser sustained discharge, demonstrated O-atom translational temperatures of 8 to 9000 K and is presently operating with 50% oxygen in argon using 500 watts of CO2 laser power which is expected to produce velocities of 4 to 5 km/s. One hour exposures of kapton, two types of fiber glass epoxy materials, and MgF2 coated optics were accomplished and preliminary results indicate that the coated aluminum optics have very low reaction rates while kapton has the highest rate. DOE

N86-12719# Joint Publications Research Service, Arlington, Va.
LAUNCH OF KOSMOS-1653 NATURAL RESOURCES RESEARCH SATELLITE Abstract Only
In its USSR Rept.: Earth Sci. (JPRS-UES-85-008) 16 Aug. 1985 p 27 Transl. into ENGLISH from Sots. Ind. (Moscow), 24 May 1985 p 2 (For primary document see N86-12697 03-42)
Avail: NTIS HC A04/MF A01

19 SPACECRAFT INSTRUMENTATION

For related information see also *06 Aircraft Instrumentation* and *35 Instrumentation and Photography.*

No abstracts in this category.

20 SPACECRAFT PROPULSION AND POWER

Includes main propulsion systems and components, e.g., rocket engines; and spacecraft auxiliary power sources.

For related information see also *07 Aircraft Propulsion, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

N86-12250# Air Force Rocket Propulsion Lab., Edwards AFB, Calif.
EXHAUST PLUME MEASUREMENTS OF 15-POUND BATES (BALLISTIC TEST AND EVALUATION SYSTEM) MOTORS Final Report, Jun. 1980 - Oct. 1984
J. A. Misener, P. A. Kessel, and T. W. Park Jun. 1985 116 p
(AF Proj. 5730)
(AD-A157249; AFRPL-TR-85-013) Avail: NTIS HC A06/MF A01 CSCL 21/9

This is the first AFRPL effort at taking certain rocket diagnosis experiments into the field. The major objectives were: (1) gauging use of laser transmissometer measurements as a plume visibility figure of merit; (2) measuring the ensemble particle size distribution function (PSDF) through application of Mie theory in deconvolving polarization/scattering laser signals from lightly-loaded (and therefore single-scattering) solid rocket motor plumes; (3) retrieving temperature and partial pressure profiles through multispectral infrared emission and absorption measurements; and (4) quantifying exit plan multispectral ultraviolet emission. Success was limited. Laser transmittance as a visibility figure of merit embeds many assumptions and has not been positively correlated with total plume detectability. Nonetheless, different propellants are seen to have characteristic transmittance values and a propellant visibility ranking using this criterion was undertaken using a limited experimental sample. The volume-to-surface effective mean particle diameters through applicable transmissometer/extinction measurements were made rather than PSDFs due to difficulties in size distribution inversion schemes and low experimental signal-to-noise ratios. GRA

23 CHEMISTRY AND MATERIALS (GENERAL)

Includes biochemistry and organic chemistry.

N86-12251# Brookhaven National Lab., Upton, N. Y.
ANAEROBIC MICROBIAL DISSOLUTION OF TOXIC METALS IN SUBSURFACE ENVIRONMENTS
A. J. Francis May 1985 6 p Presented at Anaerobic Biogeochem. Proc. in Subsurface Transportation - An Interactive Seminar, University Park, Pa., 14 May 1985
(DE-AC02-76CH-00016)
(DE85-013308; BNL-36571; CONF-850521-1) Avail: NTIS HC A02/MF A01

Initial laboratory and field studies indicate that under appropriate conditions, trace metal dissolution due to anaerobic microbial action in subsurface environments could be significant. Anaerobic microbial dissolution of trace metals may be from: (1) naturally occurring forms of minerals, (2) modified or altered forms due to energy related activities, or (3) trace metals co-precipitated with iron-oxides. Further research is under way to elucidate the mechanism of anaerobic microbial dissolution of toxic metals and to determine the influence of subsurface environmental variables on microbial transformations of metals and organometallics. DOE

N86-12252# Argonne National Lab., Ill.
ADSORPTION/DESORPTION PROPERTIES OF VACUUM MATERIALS FOR THE 6 GeV SYNCHROTRON
A. R. Krauss 1985 23 p Presented at the Machine Workshop on the 6 GeV Synchrotron Radiation Source, Gaithersburg, Md., 28 Mar. 1985
(Contract W-31-019-eng-38)
(DE85-010276; CONF-8503134-1) Avail: NTIS HC A02/MF A01

Considerable attention must be paid to the vacuum and adsorption/desorption properties of all materials installed inside the vacuum envelope if the design goals of the 6 GeV synchrotron are to be met. Unfortunately, the data is very sparse in several key areas. Additionally, some procedures normally associated with good vacuum practice, such as air braking, may prove to be totally unsuitable on the basis of desorption properties. A brief discussion of the adsorption, outgassing, electron-stimulated desorption (ESD), and photon-stimulated desorption (PSD) properties of vacuum materials as they relate to the design of a 6 GeV synchrotron is presented. DOE

N86-12253# Florida Univ., Gainesville.
METAL DISSOLUTION KINETICS IN ORGANIC SOLVENTS USING ROTATING RING-DISC VOLTAMMETRY Final Report
[1985] 70 p refs
(Contract DE-AS05-81ER-10951)
(DE85-013478; DOE/ER-10951/T1) Avail: NTIS HC A04/MF A01

The effect of a two phase liquid system, composed of geothermal brine and an organic heat transfer fluid, on the stability of materials used in the energy conversion system was investigated. The principle organic liquids used were isobutane and isopentane. The effects of relative fluid velocity on the corrosion behavior of representative construction materials, austenitic stainless steels, nickel, and copper alloy were determined using an autoclave incorporating a rotating ring disc electrode. DOE

24 COMPOSITE MATERIALS

Includes laminates.

N86-12254 Virginia Polytechnic Inst. and State Univ., Blacksburg.
AUTOMATED DESIGN OF COMPOSITE PLATES FOR IMPROVED DAMAGE TOLERANCE Ph.D. Thesis
Zafer Gurdal 1985 165 p
Avail: Univ. Microfilms Order No. DA8511985

An automated procedure for designing minimum-weight composite plates subject to a local damage constraint under tensile and compressive loading has been developed. A strain based criterion was used to obtain fracture toughness of cracked plates under tension. Results of an experimental investigation of the effects of simulated through-the-thickness cracks on the buckling, postbuckling, and failure characteristics of composite flat plates were presented. A model for kinking failure of fibers at the crack tip was developed for compression loadings. A finite element program based on linear elastic fracture mechanics for calculating stress intensity factor (SIF) was incorporated in the design cycle. A general purpose mathematical optimization algorithm was used for the weight minimization. Analytical sensitivity derivatives of the SIF, obtained by employing the adjoint variable technique, were used to enhance the computational efficiency of the procedure. Design results for both unstiffened and stiffened plates are presented. Dissert. Abstr.

N86-12255*# Missouri Univ., Rolla. Dept. of Engineering Mechanics.
MIXED-MODE CYCLIC DEBONDING OF ADHESIVELY BONDED COMPOSITE JOINTS M.S. Thesis
Mohammad Ali Rezaizadeh and Shankar Mall Oct. 1985 59 p refs
(Grant NAG1-425)
(NASA-CR-177991; NAS 1.26:177991) Avail: NTIS HC A04/MF A01 CSCL 11D

A combined experimental-analytical investigation to characterize the cyclic failure mechanism of a simple composite-to-composite bonded joint is conducted. The cracked lap shear (CLS) specimens of graphite/epoxy adherend bonded with EC-3445 adhesive are tested under combined mode 1 and 2 loading. In all specimens tested, fatigue failure occurs in the form of cyclic debonding. The cyclic debond growth rates are measured. The finite element analysis is employed to compute the mode 1, mode 2, and total strain energy release rates (i.e., GI, GII, and GT). A wide range of mixed-mode loading, i.e., GI/GII ranging from 0.03 to 0.38, is obtained. The total strain energy release rate, G sub T, appeared to be the driving parameter for cyclic debonding in the tested composite bonded system. Author

N86-12256*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
THE 371 DEG C MECHANICAL PROPERTIES OF GRAPHITE/POLYIMIDE COMPOSITES
Peter Delvigs [1985] 14 p refs Presented at the 2nd Intern. Conf. on Polyimides, Ellenville, N.Y., 30 Oct. - 1 Nov. 1985; sponsored by the Society of Plastics Engineers, Inc.
(NASA-TM-87122; E-2730; NAS 1.15:87122) Avail: NTIS HC A02/MF A01 CSCL 11D

A series of condensation polyimides based on pyromellitic dianhydride is synthesized and evaluated for potential application at 371 C. Several three-and four-ring benzenoid diamine systems containing oxygen bridging groups are investigated. Thermomechanical analysis of neat resin specimens indicate that the polyimide prepared from the dimethyl ester of pyrometallitic acid (PMDE) and 2,2-bis[4-(4'-aminophenoxy) phenyl]-1,1,1,3,3,3-hexafluoropropane (BDAF) is the only resin system which has a glass transition temperature (Tg) above 371 C. The Tg of the PMDE/BDAF polyimide is found to be 390 C after a postcure air at 371 C for 24 hr. Unidirectional composites are fabricated from the PMDE/BDAF system and unsized Celion 6000 graphite fibers. Final cure temperatures in the range of 371 to 427 C with an applied pressure of 10.34 to 13.78 MPa are investigated. The void content of the composites ranges from 4.6 to 8.6 percent. Composites cured at 399 C under a pressure of 10.34 MPa and postcured in air at 371 C for 24 hr exhibit the highest 371 C interlaminar shear strength (ILSS, 40.7 MPa) and flexural strength (758 MPa). The thermo-oxidative stability of the composites is determined by subjecting specimens to isothermal exposure at 371 C in air at atmospheric pressure, as well as a pressure of 0.52 MPa. Specimens exposed at atmospheric pressure exhibit a weight loss of 12 percent after 200 hr of exposure and 88 percent retention of its original 371 C ILSS. In contrast, the specimens exposed at 0.52 MPa pressure exhibit a comparable weight loss after only 72 hr, and a 71 percent retention of its original 371 C ILSS. Author

N86-12257*# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Chemistry.
FRACTURE SURFACE ANALYSIS IN COMPOSITE AND TITANIUM BONDING
T. A. DeVilbiss and J. P. Wightman Sep. 1985 39 p refs
(Grant NAG1-343)
(NASA-CR-176309; NAS 1.26:176309) Avail: NTIS HC A03/MF A01 CSCL 11D

To understand the mechanical properties of fiber-reinforced composite materials, it is necessary to understand the mechanical properties of the matrix materials and of the reinforcing fibers. Another factor that can affect the mechanical properties of a composite material is the interaction between the fiber and the matrix. In general, composites with strong fiber matrix bonding will give higher modulus, lower toughness composites. Composites with weak bonding will have a lower modulus and more ductility. The situation becomes a bit more complex when all possibilities are examined. To be considered are the following: the properties of the surface layer on the fiber, the interactive forces between polymer and matrix, the surface roughness and porosity of the fiber, and the morphology of the matrix polymer at the fiber surface. In practice, the surface of the fibers is treated to enhance the mechanical properties of a composite. These treatments include anodization, acid etching, high temperature oxidation, and plasma oxidation, to name a few. The goal is to be able to predict the surface properties of carbon fibers treated in various ways, and then to relate surface properties to fiber matrix bonding. author

N86-12258*# Wyoming Univ., Laramie. Composite Materials Research Group.
IOSIPESCU SHEAR PROPERTIES OF GRAPHITE FABRIC/EPOXY COMPOSITE LAMINATES Final Technical Report, May 1984 - May 1985
David E. Walrath and Donald F. Adams Jun. 1985 130 p refs
(Grant NAG1-272)
(NASA-CR-176316; NAS 1.26:176316; UWME-DR-501-103-1)
Avail: NTIS HC A07/MF A01 CSCL 11D

The Iosipescu shear test method is used to measure the in-plane and interlaminar shear properties of four T300 graphite fabric/934 epoxy composite materials. Different weave geometries tested include an Oxford weave, a 5-harness satin weave, an 8-harness satin weave, and a plain weave with auxiliary warp yarns. Both orthogonal and quasi-isotropic layup laminates were tested. In-plane and interlaminar shear properties are obtained for laminates of all four fabric types. Overall, little difference in shear properties attributable to the fabric weave pattern is observed. The auxiliary warp material is significantly weaker and less stiff in interlaminar shear parallel to its fill direction. A conventional strain gage extensometer is modified to measure shear strains for use with the Iosipescu shear test. While preliminary results are encouraging, several design iterations failed to produce a reliable shear transducer prototype. Strain gages are still the most reliable shear strain transducers for use with this test method. Author

N86-12259*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
EFFECT OF MEASURED MATERIAL PROPERTIES ON THE FINITE ELEMENT ANALYSIS OF AN OH-58 COMPOSITE TAIL

BOOM

Lynn M. Bowman Oct. 1985 28 p refs
(DA Proj. 1L1-61102-AH-45)
(NASA-TM-86430; L-15969; NAS 1.15:86430;
AVSCOM-TR-85-B-5) Avail: NTIS HC A03/MF A01 CSCL 11D

A static and dynamic finite element analysis is conducted on a U.S. Army OH-58 composite tail boom and compared with test data. The tail boom is a filament-wound graphite/epoxy monocoque structure. The structural design of the composite tail boom skin is based on 50-percent graphite fiber volume. However, material tests on representative samples of the tail boom skin reveal that the graphite fiber-volume fraction varied from 44.6 to 49.3 percent. To determine the effect of using measured material properties, static and dynamic finite element analyses are conducted for three fiber-volume conditions of 45, 48, and 50 percent. The static and dynamic model with the 45-percent fiber-volume graphite skins gives the closest agreement with test data. Author

N86-12260# Army Materials and Mechanics Research Center, Watertown, Mass.

MATERIALS AND PROCESS CHARACTERIZATION TO DETERMINE THE EFFECT OF HIGH INTENSITY INFRARED LASER RADIATION ON A COMPOSITE MATERIAL

J. S. Perkins, P. W. Wong, D. J. Jaklitsch, L. Elandjian, and A. F. Connolly Mar. 1985 24 p
(DA Proj. 1L1-62105-AH-84)
(AD-A157094; AMMRC-TR-85-3) Avail: NTIS HC A02/MF A01 CSCL 11/4

Measurements were made of the true (black body) surface temperature of a well-characterized metal-doped carbon-carbon composite during irradiation with an intense, continuous-wave, CO2-laser beam along with spectrometric determination of the temporal variation of C2 and C3 species appearing in the laser-induced plume in a high vacuum environment. Various analytical methods used for post-burn analyses, during irradiation analyses, and material characterization are detailed. Thermodynamic aspects are considered. A synopsis of the stages in laser/beam/composite interaction derived from this study is included. GRA

N86-12261# Massachusetts Inst. of Tech., Cambridge. Materials Processing Center.

MICROSTRUCTURE/PROPERTY RELATIONSHIPS FOR CARBON FIBER REINFORCED ALUMINUM ALLOYS Final Technical Report

R. G. Dixon, J. A. Cornie, and M. C. Flemings 1984 109 p
(Contract N00017-83-K-0677)
(AD-A157858) Avail: NTIS HC A06/MF A01 CSCL 11/4

Graphite fibers with various coatings tested for strength. Longitudinal composites were produced from the coated fibers using pure aluminum as the matrix by pressure casting. The strength and microstructure of the composites was evaluated. Longitudinal and transverse composites were also produced using uncoated graphite fibers with various alloy matrices and their strength and microstructure evaluated. The coated fibers were leached from the pure aluminum matrix and examined. The uncoated graphite fibers were leached from the alloy matrices and tested for strength. The coated fibers were not found to be stronger that the uncoated fibers, nor were they effective in increasing composite strengths. Composites produced from uncoated fibers and alloy matrices were quite strong longitudinally with strengths of up to 93 percent of rule of mixtures strength. The same material, when tested in the transverse direction exhibited low strengths, with the failure being interfacial. GRA

N86-12262# Institute for Defense Analyses, Alexandria, Va.

MINUTES OF WORKSHOP ON COMPOSITE MATERIALS TEST METHODS Final Report

S. L. Channon Apr. 1985 156 p Workshop held at Alexandria, Va., 27 Feb. 1985
(Contract MDA903-84-C-0031)
(AD-A157903; AD-E500722; IDA-M-81; IDA/HQ-85-29831) Avail: NTIS HC A08/MF A01 CSCL 11/4

The advanced composite materials community has recognized the need for standardization of test methods as the most important step in improving the acceptance of composite materials, in providing a reliable data base and in qualifying new materials. A survey of advanced composites suppliers and end users showed a strong interest in developing standardized test methods, the greatest need being for shear and compression testing as well as standardized methods for test specimen preparation. A test program was formulated which is aimed at screening available methods in these areas on several types of materials, determining the repeatability of selected test methods by testing at a large number of laboratories, followed by analyses of the data. In addition, provision is made for the development of improved test methods and subsequent evaluation of these methods. The first phase of the program was estimated to cost $2.5 million and would require 2.5 years for completion. GRA

N86-12263# Lawrence Livermore National Lab., Calif.

MACROSCOPIC AND MICROSCOPIC DEFORMATION AND FAILURE PROCESSES THAT CONTROL COMPOSITE TOUGHNESS

R. J. Morgan and C. O. Pruneda 12 Feb. 1985 21 p Presented at the ASTM Symp. on Toughened Composites, Houston, Tex., 13 Mar. 1985
(Contract W-7405-eng-48)
(DE85-012938; UCRL-91366; CONF-8503142-1) Avail: NTIS HC A02/MF A01

Stress optical microscopy and fracture topography studies of a variety of fibrous composites are presented and discussed in terms of the composite macroscopic and microscopic deformation and failure processes. Composite toughening mechanisms associated with the fiber failure processes and fiber matrix interfacial strength are discussed. Molecular flow in the composite matrix, which enhances composite toughness, occurs either in the form of macroscopic homogeneous plastic flow or inhomogeneously in the form of crazing or shear banding. The physical parameters that control the toughening mechanisms in epoxy, thermoplastic and polyimide composite matrices are discussed. Effects of service environment exposure on the elimination of these toughening mechanisms which results in composite embrittlement are also considered. DOE

N86-12264# Tennessee Univ., Knoxville. Dept. of Materials Science and Engineering.

DYNAMIC SMALL ANGLE X-RAY SCATTERING STUDY OF STRESSED KEVLAR 49 EPOXY COMPOSITES

J. S. Lee, J. F. Fellers, M. Y. Tang, and J. S. Lin 1985 9 p Presented at the Soc. of Plastics Eng. Meeting, Washington, D.C., 29 Apr. 1985 Prepared in cooperation with ORNL
(Contract DE-AC05-84OR-21400)
(DE85-011408; CONF-8504143-1) Avail: NTIS HC A02/MF A01

The highly crosslinked epoxy resins gave rise to isotropic scattering patterns and applying tensile stresses resulted in very little scattering changes. The dynamic scattering studies on the epoxy resins indicate the failure process as a catastrophic dynamic process with fractures initiating from surface or internal flaws. The crack propagates across the whole sample in a very short time to complete failure. The Kevlar fibers are microporous giving rise to equatorially elongated anisotropic scattering patterns. These microvoids can be partially filled by liquid epoxy. Based on comparisons of the volume fraction of the microvoids obtained by SAXS absolute intensity measurements and by the density measurements, two sizes of microvoids are present in the Kevlar 49 fibers - one in the range of 10 to 20 nm and the other much larger. Applying tensile stresses results in an increase in the scattering intensities and in the volume fraction of smaller microvoids. The average radius of gyration of these microvoids remained constant, and hence the number of these smaller microvoids must have increased in order to account for increased scattering intensities. It is thus concluded that the failure of Kevlar 49 fibers is accompanied by the increase in number of smaller microvoids and the enlargement of the larger microvoids along the fiber axis direction. The reinforced epoxy composites of low

volume fraction unidirectional Kevlar 49 fiber gave rise to anisotropic scattering patterns perpendicular to the fiber axis direction, and it is believed this scattering is due to voids within the fibers and voids entrapped along the fiber matrix interface during processing. DOE

N86-12265# Du Pont de Nemours (E. I.) and Co., Aiken, S.C.
U308 POWDER FROM URANYL-LOADED CATION EXCHANGE RESIN
W. C. Mosley 1985 29 p refs Presented at the Am. Ceram. Soc. Ann. Meeting, Cincinnati, 5 May 1985
(Contract DE-AC09076SR-00001)
(DE85-013231; DP-MS-84-126; CONF-850536-5) Avail: NTIS HC A03/MF A01

U308 powder has been produced from uranyl-loaded cation exchange resin with density, particle size distribution, and grain size suitable for powder metallurgy fabrication of reactor fuel tubes with Al-U308 cores. Macroporous sulfonate resin in granular form is used in the process. Resin conversion techniques that were evaluated include batch, rotary, and fluidized bed calcination. DOE

25 INORGANIC AND PHYSICAL CHEMISTRY

Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry.

For related information see also *77 Thermodynamics and Statistical Physics.*

N86-12266 Michigan Univ., Ann Arbor.
GROUP COMBUSTION OF SPRAYS Ph.D. Thesis
Sampathkumar Palaniswamy 1985 174 p
Avail: Univ. Microfilms Order No. DA8512483

In the group combustion limit, fuel sprays evaporate and burn as a group and not as individual droplets. Only the outermost droplets in the cloud evaporate, and conditions within within the cloud remain uniform during most part of the cloud life time. The burning charcteristics of a cloud undergoing group combustion is studied using activation energy asymptotics. The relationship between the ambient temperature and the gas-phase Damkohler number is obtained for ignition and extinction of the fuel cloud. It is found that larger fuel clouds ignite at lower ambient temperature than the smaller clouds and, therefore, a single drop as well. The effect of drop-size distribution is analyzed using a phenomenological model. It is found that for a simple bimodel dropsize distribution the burning characteristics of the cloud do not change.
Dissert. Abstr.

N86-12267 Department of the Navy, Washington, D. C.
PICOSECOND BROADBAND CARS PROBE USING THE PICOSECOND CONTINUUM Patent
L. S. Goldberg, inventor (to Navy) Issued 23 Apr. 1985 8 p Supersedes AD-D010311
(AD-D011840; US-Patent-4,512,660; US-Patent-Appl-SN-484810; US-Patent-Class-356-301) Avail: US Patent and Trademark Office CSCL 07/4

A coherent anti-Stokes Raman spectroscopy (CARS) method and apparatus for producing a broadband CARS vibrational spectrum of a sample in a single picosecond laser pulse is discussed. A laser pulse having a picosecond duration and a frequency of omega is directed into a liquid cell containing D2O which generates a picosecond continuum pulse having a broad range of frequencies omega (WL) and a picosecond duration. A second harmonic of the laser pulse is produced to form a probe pulse having a frequency of omega (1) and a picosecond duration. The probe pulse and the continuum pulse are spatially and temporally combined and the combined pulses are directed into a sample to excite the Raman active vibrational resonances in the sample. In response the sample emits a beam of radiation which contains an anti-Stokes spectrum of energy characteristic of the sample. The anti-Stokes spectrum is separated from the beam of radiation for detection and analysis. GRA

N86-12268*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EVALUATION PARAMETERS FOR THE ALKALINE FUEL CELL OXYGEN ELECTRODE
Joseph Singer and Vakula Srinivasan (Bowling Green State Univ., Ohio) Nov. 1985 13 p refs
(NASA-TM-87155; E-2669; NAS 1.15:87155) Avail: NTIS HC A02/MF A01 CSCL 07D

Studies were made of Pt- and Au-catalyzed porous electrodes, designed for the cathode of the alkaline H2/O2 fuel cell, employing cyclic voltammetry and the floating half-cell method. The purpose was to obtain parameters from the cyclic voltammograms which could predict performance in the fuel cell. It was found that a satisfactory relationship between these two types of measurement could not be established; however, useful observations were made of relative performance of several types of carbon used as supports for noble metal catalysts and of some Au catalysts. The best half-cell performance with H2/O2 in a 35 percent KOH electrolyte at 80 C was given by unsupported fine particle Au on Teflon; this electrode is used in the Orbiter fuel cell. Author

N86-12269# Air Force Systems Command, Wright-Patterson AFB, Ohio.
KINETICS OF EVAPORATION AND GROWTH OF DROPS OF AQUEOUS SOLUTIONS OF SURFACE ACTIVE SUBSTANCES AT NEGATIVE TEMPERATURES
Y. I. Sokolov 25 Jun. 1985 11 p refs Transl. into ENGLISH from Fiz. Aerodispersnkyk Sistem (USSR), no. 7, 1972 p 20-25
(AD-A156961; FTD-ID(RS)T-0938-84) Avail: NTIS HC A02/MF A01 CSCL 07/4

It is established that surface active substances (SAS), both soluble and insoluble, substantially slow the rate of evaporation of water drops. In the case of insoluble SAS the slowing of evaporation comes down to the creation of a mechanical barrier by SAS molecules, preventing the outlet of water molecules from the surface of the drop. A formula is theoretically obtained, expressing the rate of quasistationary evaporation of a drop of water covered with a layer of insoluble SAS. GRA

N86-12270# North Carolina Univ., Raleigh. Dept. of Chemistry.
CHARGE TRANSFER IN MULTIPLE SITE CHEMICAL SYSTEMS Final Report, Apr. 1982 - Apr. 1985
T. J. Meyer 30 May 1985 18 p
(Contract DAAG29-82-K-0111)
(AD-A157413; ARO-19011.1-CH) Avail: NTIS HC A02/MF A01 CSCL 07/4

This report covers work done by the author in both mixed-valence dimers and metallopolymers. Concerning the dimers, crystal structures of related monomers were obtained to judge the adequacy of classical approximations in calculating inner-sphere vibrational trapping. A series of homometallic and heterometallic dimers were prepared and a relationship between redox asymmetry and intervalence transfer absorption band energy was found. Electronic structure was observed in the intervalence transfer absorption band of an OS(II)-Os(III) mixed-valence dimer, owing to the presence of well-separated spin orbit states in Os(III). Other dimers were prepared to study the transitions between various states within the dimers. Both metal to metal and ligand to ligand electron transfer was seen in optically prepared mixed-valence dimers. Concerning the polymers, redox-site incorporation into poly-vinylpyridine, P-chlorosulfonated polystyrene and oxidatively electro-polymerized films were studied. Characterization and stability of these films as well as comparison to monomeric analogues was accomplished. Practical application of the metallopolymers include their use as a chromophore in a photoelectrochemical cell and as a catalyst for the oxidation of C1- to C12.
GRA

N86-12271# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

EXPERIMENTAL STUDY OF THE COMBUSTION OF GAS-AIR MIXTURES IN A CHANNEL AND THE DIFFUSION COMBUSTION IN A SLIPSTREAM AT HIGH VELOCITIES

V. K. Bayev, P. K. Tretyakov, and V. A. Yasakov 16 Jul. 1985 49 p Transl. into ENGLISH from mono. "Sovremennoye Sostoyaniye i Teoriya Sgoraniya Kondensirovannykh Sistem" Moscow, 1972 p 357-360, 386-391, 416-420, 421-425

(AD-A157495; FTD-ID(RS)T-1323-84) Avail: NTIS HC A03/MF A01 CSCL 21/2

This translation contains three additional papers by other authors. Their titles are: Ignition and Interruption of Combustion in the Stagnation Zone During Flow Around a Flatstep or Indentation by a Supersonic Flow of Combustible Mixture; Combustion of Rich Kerosine-Air Mixture in Tunnel Type Chamber; and Mechanism of the Process of Combustion After the Front Devices and in the Zone of the Inflow of the Jets of Secondary Air in the Chambers of Gas-Turbine Engine. GRA

N86-12272# Arnold Engineering Development Center, Arnold Air Force Station, Tenn.

METHOD TO DETECT ETHYLENE GLYCOL IN GASEOUS MIXTURES Final Report, 1 Oct. 1982 - 30 Sep. 1983

R. E. Willis Aug. 1985 53 p Prepared in cooperation with Sverdrup Technology, Inc., Arnold AFS, TN

(AD-A158109; AEDC-TR-85-39) Avail: NTIS HC A04/MF A01 CSCL 07/4

Ethylene glycol is used as a refrigerant for the intake air during simulated altitude testing. There have been some problems during these tests because of the ethylene glycol accidentally leaking into the inlet airstream. Since ethylene glycol has at times been suspected of interfering with the test article, its early detection would be greatly beneficial so that testing could be stopped before damage occurs. Because a detection scheme must indicate the presence of ethylene glycol as soon as it appears in the inlet airstream, a spectroscopic technique is preferred over other methods of gas analysis such as sampling and subsequent laboratory analysis. A study was conducted to determine if microwave spectroscopy techniques could be used to monitor the level of ethylene glycol in the inlet airstream to the Engine Test Facility (ETF) test cells during simulated altitude testing. The theory of microwave spectroscopy and the spectra of ethylene glycol are reviewed. Three separate designs of microwave spectrometers are presented which should be capable of monitoring ethylene glycol in the inlet airstreams with a sensitivity of at least 10 ppm. GRA

N86-12273# California Univ., Los Angeles. Dept. of Materials Sciences and Engineering.

PREPARATION AND PROPERTIES OF THIN FILM REVERSIBLE CATHODE MATERIALS Final Report, 1 Jun. 1982 - 31 May 1985

B. Dunn and R. F. Bunshah Jul. 1985 28 p

(Contract DAAG29-82-K-0145)

(AD-A158431; ARO-19267.3-CH) Avail: NTIS HC A03/MF A01 CSCL 09/1

The research program clearly established that a reversible cathode material with a highly anisotropic structure could be prepared as a thin film, 2 to 5 micrometers thick. The research emphasized the synthesis of TiS2 by the evaporation of titanium in a plasma-enhanced H2S gas. Nearly-stoichiometric films of TiS2 were produced. The electrical conductivity and certain electrochemical properties of the films were comparable to the bulk material. Lithium diffusion coefficients were found to be lower than the bulk material and dependent upon film composition. GRA

N86-12274# Johns Hopkins Univ., Baltimore, Md. Dept. of Chemical Engineering.

THERMODYNAMICS OF MULTI-POLAR MOLECULES: THE PERTURBED-ANISOTROPIC-CHAIN THEORY

P. Vimalchand, M. D. Donohue, and I. C. Celmins 1985 43 p refs Presented at the 189th Natl. Meeting of the Am. Chem. Soc., Miami, Fla., 28 Apr. 1985

(Contract DE-AC02-81ER-10982)

(DE85-013148; DOE/ER-10982/5; CONF-850417-22) Avail: NTIS HC A03/MF A01

The Perturbed-Hard-Chain Theory (PHCT) is modified to treat rigorously dipolar and quadrupolar fluids and their mixtures. The multi-polar interactions, expansion of Gubbins and Twu to chain molecules. Moreover, the square-well potential used to characterize the spherically symmetric interactions in the PHCT has been replaced by a soft-core (Leonard-Jones) potential. Theoretical calculations and data reduction on a number of pure fluids and mixtures indicate that the above changes result in physically more meaningful pure component parameters, and the properties of even highly non-ideal mixtures can be predicted accurately without the use of a binary interaction parameter. DOE

N86-12275# Argonne National Lab., Ill.

ELECTROCHEMICAL DEPOSITION OF GLASSY CHROMIUM ON COPPER

R. Varma, A. McKiernan, and M. J. Klugh 1985 2 p Presented at the 167th Electrochem. Soc. Meeting, Toronto, 12 May 1985

(Contract W-31-109-eng-38)

(DE85-004081; CONF-850542-1) Avail: NTIS HC A02/MF A01

Electrochemical deposition of chromium at 1.0 to 5.0 A/cu(2) from aqueous electrolytes has been investigated. Results of X-ray diffraction and scanning electron microscopy of the film deposits are presented. Also, measurements of the corrosion of such coatings in a saline environment are discussed. DOE

N86-12276# Texas Southern Univ., Houston. Dept. of Chemistry.

STUDY OF SOME TRANSITION METAL COMPLEXES AS PROCESS CATALYSTS Quarterly Report, 1 Mar. - 31 May 1985

B. L. Wilson 1985 11 p

(Contract DE-FG22-84PC-70753)

(DE85-013428; DOE/PC-70753/T3) Avail: NTIS HC A02/MF A01

The main objectives of this project are the following: (1) preparation and characterization of transition metal complexes with nitrogen, oxygen and sulfur donor ligands especially the poly(pyrazolyl)borate ligands; (2) preparation of bimetallic complexes of molybdenum and other metals such as nickel, cobalt, and iron; (3) determination of the ability of the above complexes to catalytically reduce polycyclic aromatic or heterocyclic compounds; (4) evaluation of these complexes as coal liquefaction catalysts; (5) evaluation of these complexes as desulfurization and denitrogenation catalysts; (6) training of students in transition metal complex preparation and characterization and in the evaluation of metal complexes as process catalysts. During this quarter the following complexes were prepared and characterized: Fe(H2B(P2)2)2, where P2 = C3H3N2; TiX2(H2B(P2)2)2, where x = Cl, Br, or I; Ti(H2B(P2)2)4; and Ni(H2B(P2)2)2. The following 2 complexes were tested for hyrogenation activities using 1-methylnaphthalene: Co(H2B(P2)2)2; and Zn(H2B(P2)2)2. DOE

N86-12277# Department of Energy, Washington, D. C.

THERMOPHORETIC SEPARATION OF AEROSOL PARTICLES FROM A SAMPLED GAS STREAM Patent Application

A. K. Postma, inventor (to DOE) (Hanford Engineering Development Lab.) Filed 7 Sep. 1984 10 p

(Contract DE-AC06-76FF-02170)

(DE85-011672; US-Patent-Appl-SN-648197) Avail: NTIS HC A02/MF A01

This disclosure relates to separation of aerosol particles from gas samples withdrawn from within a contained atmosphere, such as containment vessels for nuclear reactors or other process equipment where remote gaseous sampling is required. It is specifically directed to separation of dense aerosols including particles of any size and at high mass loadings and high corrosivity. The United States Government has rights in this invention pursuant to Contract DE-AC06-76FF-02170 between the US Department of Energy and Westinghouse Electric Corporation. DOE

N86-12278# Massachusetts Inst. of Tech., Cambridge.

FISCHER-TROPSCH SYNTHESIS IN SLURRY REACTOR

SYSTEMS Final Report
22 Apr. 1985 7 p
(Contract DE-FG22-81PC-40771)
(DE85-013390; DOE/PC-40771/T4) Avail: NTIS HC A02/MF A01

The purpose of this grant was to support a variety of studies of Fischer-Tropsch synthesis in a slurry reactor. Experimental reaction studies were performed in a semicontinuous mechanically stirred autoclave using iron catalysts, primarily a reduced fused magnetite catalyst promoted with potassium, as manufactured for ammonia synthesis. Our findings have been published in 14 papers with 3 more accepted and in press. These are listed together with the abstracts, which highlight our accomplishments. DOE

N86-12279# Boston Univ., Mass. Dept. of Chemistry.
FORMATION OF FUEL VIA PHOTOCHEMICAL ELECTRON TRANSFER Annual Report
G. Jones 4 Mar. 1985 5 p
(Contract DE-AC02-77ER-04380)
(DE85-011168; DOE/ER-04380/T2) Avail: NTIS HC A02/MF A01

Accomplishments for the past year are reported under the following three main headings, in addition to several other related studies: (1) heterocyclic sulfur compounds which display unusual poperties as electron relays which may be important in chemical or fuel forming reactions; (2) cationic dyes which tend to aggregate in interesting ways when bound to polyanion in water; and (3) photochemistry of viologen or pyridinium ions which are complexed or ion-paired with electron donors. A publications update is appended with references cited in this report. DOE

N86-12280# California Univ., Berkeley.
RAMAN SPECTROSCOPY OF MOLECULAR ADSORBATES Final Report
J. Hemminger 13 May 1985 16 p
(Contract DE-AT03-81ER-10820)
(DE85-012981; DOE/ER-10820/T1) Avail: NTIS HC A02/MF A01

Inelastic light scattering probes are used in conjunction with the standard electron beam probes to study the binding and structure of molecular adsorbates on well-characterized metal surfaces. The ultimate objective is to probe the details of corrosion and catalysis on metal surfaces, and the chemistry of molecular adsorbates. Inelastic light scattering spectroscopy has two outstanding advantages over various electron spectroscopic techniques: the first is that light scattering can operate in the presence of a high pressure of gases and even liquids, and the second advantage is its high resolution. Thus by inelastic light scattering spectroscopy we will be able to investigate the interaction of molecules with metal surfaces under realistic pressures for corrosion and chemistry. DOE

N86-12281# IIT Research Inst., Bartlesville, Okla. National Inst. for Petroleum and Energy Research.
LIQUID CHROMATOGRAPHY ON SILICA USING MOBILE PHASES CONTAINING TETRAALKYLAMMONIUM HYDROXIDES. 1: GENERAL SEPARATION SELECTIVITY AND BEHAVIOR OF POLAR COMPOUNDS TYPICALLY IN FUELS
J. B. Green Jun. 1985 44 p refs
(Contract DE-FC03-83FE-60149)
(DE85-014450; NIPER-75) Avail: NTIS HC A03/MF A01

The known selectivity of base-modified silicas for acidic solutes led to development of the in-situ tetraalkylammonium hydroxide (TAAH)-modified silica HPLC systems described here. These systems are generated by adding small concentrations of TAAH to normal phase eluents pumped through conventional silica columns. The in-situ approach has the following advantages: the type and concentration of TAAH can be varied to control separation behavior and selectivity; greater column-to-column consistency and separation reproducibility is achieved; commercially available columns and packings are used; and the TAAH in the mobile phase also serves as an electrolyte for electrochemical detection of solutes, if desired. Retention of 180 solutes spanning several classes of compounds is measured in four different systems; the applicability of this approach to separation of acid concentrates from fuels as well as its compatibility with electrochemical detectors is demonstrated; and in addition, general chromatographic parameters such as the effect of the mobile phase composition on retention and selectivity are discussed. DOE

N86-12282# California Univ., Berkeley. Lawrence Berkeley Lab.
NANOSECOND FLUORESCENCE SPECTROSCOPY
B. Ieskovar Mar. 1985 12 p refs Presented at IEEE Symp., San Francisco, 23 Oct. 1985
(Contract DE-AC03-76SF-00098)
(DE85-012234; LBL-19291; CONF-851097-1) Avail: NTIS HC A02/MF A01

This article is a summary of a short course lecture given in conjunction with the 1984 Nuclear Science Symposium. Measuring systems for nanosecond fluorescence spectroscopy using single photon counting techniques are presented. These involve systems based on relaxation type spark gas light pulsar and synchronously pumped mode locked dye lasers. Furthermore, typical characteristics and optimization of operating conditions of the critical components responsible for the system time resolution are discussed. A short comparison of the most important deconvolution methods for numerical analysis of experimental data is given particularly with respect to the signal to noise ratio of the fluorescence signal. DOE

N86-12283# Purdue Univ., West Lafayette, Ind. Dept. of Chemistry.
MEASUREMENT OF SPECIES CONCENTRATIONS IN FLAMES BY LASER-INDUCED FLUORESCENCE Final Report
N. M. Laurendeau and F. E. Lytle Mar. 1985 57 p refs
(Contract DE-AC02-78ER-04939)
(DE85-012092; DOE/ER-04939/T2; COO-4939) Avail: NTIS HC A04/MF A01

We are currently developing laser-induced fluorescence technigues for determining the concentrations of selected species in flames. Research proposed herein involves (1) continued application of laser-saturated fluorescence to the diatomic radicals CN, CH and NO; (2) continued development of two-photon-induced fluorescence for atomic hydrogen and atomic oxygen; and (3) continued development of single-photon fluorescence for mixtures of polycyclic aromatic hydrocarbons (PAH's). New research is proposed on: (1) application of two-photon fluorescence to diatomic species such as NO; (2) development of two-photon fluorescence for mixtures of polycyclic aromatic hydrocarbons; and (3) extension of laser-saturated fluorescence to linear and nonlinear polyatomics. DOE

N86-12284# Los Alamos Scientific Lab., N. Mex.
OXIDATION OF HETEROCYCLIC NITROGEN YIELDS TO NITROHETEROCYCLES
M. D. Coburn 1985 8 p refs Presented at the Working Group Meeting on Synthesis of High Energy Mater., Dover, N.J., 4 Jun. 1985
(Contract W-7405-eng-36)
(DE85-012757; LA-UR-85-1935; CONF-8506119-1) Avail: NTIS HC A02/MF A01

In the process of finding new routes to synthesize nitrofurazans the investigators compared the oxidation of a sulfilimide and a phosphine imine derived from 3-amino-4-(chlorophenyl)furazan. The sulfilimine, 3-(4-chlorophenyl)-4-dimethyl-sulfiliminofurazan, was prepared by treating 1 with dimethyl sulfide ditriflate. Oxidation of 1 with peroxytrifluoroacetic acid (ptfa) in dichloromethane gave a mixture that was chromatographed to give 3-(4-chlorophenyl)-4-nitro-furazan in 11% yield and azoxy (4-chlorophenylfurazan) in 32% yield. Under the same conditions, 2 gave a 96% yield of 5 with no trace of 6. Oxidation of diaminofurazan with ptfa gives 3-amino-4-nitrofurazan which was converted to the sulfilimine. Treatment of the sulfilimine with anhydrous ptfa in dichloromethane gave a solution that contained dimethyl sulfone according to (13)C-NMR analysis, but no nitrocarbon could be detected. However, the (14)N-NME spectrum contained a very sharp singlet

with a width at half height of 19 Hz and a chemical shift almost identical to that of 5. Thus, it appears that we may have formed dinitrofurazan in solution, but we have not been able to isolate it in pure form as yet. DOE

N86-12285# Los Alamos Scientific Lab., N. Mex.
APPLICATION OF TIME-DEPENDENT RAMAN THEORY TO THE ANALYSIS OF INORGANIC PHOTOSYSTEMS
D. E. Morris and W. H. Woodruff 1985 5 p refs Presented at 2nd Intern. Conf. on Time-Resolved Vibrational Spectry., Bayreuth-Bischofsgrun, West Germany, 3 Jun. 1985
(Contract W-7405-eng-36)
(DE85-012752; LA-UR-85-1957; CONF-8506132-1) Avail: NTIS HC A02/MF A01

The more general formulation of Heller's theory outlined here should make it possible to characterize the excited states of real and chemically interesting systems with a high degree of reliability provided care is exercised in considering the influence of all factors in determining the scattering dynamics. The reliance of this method on ground-state Raman intensities make it particularly convenient and a valuable complement to the more direct but often experimentally prohibitive methods such as TRVS. While further testing of the predictions of this formalism is required, preliminary results as presented here are encouraging. DOE

N86-12286# Bureau of Mines, Reno, Nev.
HYDROGEN CHLORIDE SPARGING CRYSTALLIZATION OF THE CHLORIDE SALTS OF COBALT, MANGANESE, AND NICKEL
D. E. Shanks and E. G. Noble 1985 26 p refs
(PB85-197002; BM-RI-8930; LC-84-600270) Avail: NTIS HC A03/MF A01 CSCL 07D

The Bureau of Mines investigated the effects of HCl concentration and solution temperature on the solubility and crystal form of the chlorides of Co, Mn, and Ni when sparged with HCl gas at temperatures of 20 degrees, 40 degrees, and 60 degrees C. Increasing HCl concentration in solution caused the chlorides of Co, Mn, and Ni to crystallize (salt out) because of the common ion effect. The salting-out crystallization was most effective for NiCl2, which had a solubility of 0.7 pct at 20 degrees C and maximum HCl concentration. GRA

N86-12287# Little (Arthur D.), Inc., Cambridge, Mass.
DEVELOPMENT OF A ROUTINE TECHNIQUE FOR ANALYSIS OF NITRO-PAH IN DIESEL PARTICULATE EXTRACT
K. T. Menzies, C. M. Wong, L. H. Magni, and M. A. Randel Feb. 1985 79 p refs
(PB85-196657; CRC-APRAC-CAPE-30-81-03) Avail: NTIS HC A05/MF A01 CSCL 07D

Several chromatographic methods potentially suitable for routine analysis of nitro-PAH in diesel particulate extract were selected from the current literature. After limited screening, a gas chromatographic separation on a fused silica capillary column with electron capture detection (ECD) was selected for method evaluation. In order to provide accurate analysis of the nitro-PAH's, a semipreparative scale, amino bonded GPLC column was evaluated to remove other compound classes which may interfere with GC/ECD analysis. As a result of this effort, an analytical method which provides adequate precision (+ or - 20%) and accuracy (+ or - 20%) for mono-nitro PAHs in diesel exhaust particulate was validated. The accuracy of the method remains undefined due to difficulties in evaluating an independent HPLC/electrochemical detection method. Author (GRA)

N86-12288# California Inst. of Tech., Pasadena. Graduate Aeronautical Labs.
COMBUSTION IN TURBULENT JETS AND BUOYANT PLUMES Annual Report, Dec. 1983 - Dec. 1984
P. E. Dimotakis, J. E. Broadwell, and E. E. Zukoski 15 Feb. 1985 62 p refs
(PB85-220655; GRI-85/0051) Avail: NTIS HC A04/MF A01 CSCL 21B

Results are reported from an ongoing investigation of the entrainment and mixing mechanisms. In momentum dominated turbulent jets, buoyancy dominated turbulent plumes, and flows which undergo a transition between these two regimes. This investigation also addresses the effects of molecular diffusion rates (Schmidt number) and combustion heat release on these mechanisms, and incorporates these mechanisms into practical modeling and predictive techniques for combustion in these flows. These measurements in large Schmidt number momentum driven jets have revealed a similarity concentration variable for which probability density functions (PDFs) display self similarity, and show that organized large scale structures play an important role in jet entrainment and mixing. Author (GRA)

N86-12289# Princeton Univ., N. J. Dept. of Chemical Engineering.
NEW CORRESPONDING STATES THEORY USING THE SECOND VIRIAL COEFFICIENT AS THE TEMPERATURE VARIABLE Topical Report, Dec. 1982 - Dec. 1984
C. K. Hall and B. A. Hacker Dec. 1984 159 p
(PB85-219624; GRI-85/0003) Avail: NTIS HC A08/MF A01 CSCL 07A

A new corresponding states theory is presented that uses an approximation to the reduced second virial coefficient as its temperature variable. This new corresponding states variable, X(T(sub r)), is chosen to be a simple function of temperature, critical temperature and the Boyle temperature. Using data generated from an accurate equation of state, it is demonstrated graphically that pure component compressibility factors are universal functions of reduced volume and the new variable X(T(sub r)) over a wide range of densities. Homogeneous mixture compressibility factors are shown to be a function of X(T(sub r)) for the limited number of systems studied, however, the correlation cannot as yet be used for two-phase binary mixtures. The theory predicts that the saturation properties of pure fluids may be represented by a universal surface, called UNISAT, upon which the reduced vapor pressure and reduced saturated gaseous and liquid densities are universal functions of X(T(sub r)). GRA

N86-12290# SRI International Corp., Menlo Park, Calif.
REDUCTION OF CO2 TO METHANOL AND METHANE BY PHOTO AND DARK REACTIONS ON SEMICONDUCTOR ELECTRODES Annual Report, 15 Feb. 1984 - 15 Feb. 1985
K. W. Frese and D. P. Summer Mar. 1985 61 p refs
(PB85-226298; GRI-85/0085) Avail: NTIS HC A04/MF A01 CSCL 07D

This report investigates the electrochemical mechanism of reduction of CO2 or carbonate species to useful fuels using semiconductor and metal electrodes. The semiconductor electrodes may be used to convert light and CO2 into fuels such as methanol and methane. Metal electrodes could be coupled to photovoltaic arrays for solar energy storage via fuel generation. By suitable electrochemical processes this inorganic carbon may be converted to organic carbon in the form of methanol and methane, which could be used as fuel. Such electrochemical conversions can be made to occur at semiconductor electrodes. In addition, semiconductor electrodes absorb light, and this light can be converted to a voltage that causes the electrochemical transformations of interest. By combining the CO2, water, semiconductor, and sunlight, the authors can store solar energy in the fuel. GRA

N86-12291# National Bureau of Standards, Gaithersburg, Md. Center for Fire Research.
MODEL DESCRIBING THE STEADY-STATE PYROLYSIS OF BUBBLE-FORMING POLYMERS IN RESPONSE TO AN INCIDENT HEAT FLUX
I. S. Wichman May 1985 48 p refs
(PB85-225225; NBSIR-85/3130) Avail: NTIS HC A03/MF A01 CSCL 07D

A theoretical model is developed to describe the indepth effect of bubbles on the steady state transport of volatile gases (monomer) from the surface of a polymer subjected to an incident heat flux. In this model the effect of the bubbles on the surrounding

(liquid) polymer is felt through the bubble number distribution function, n, which appears in the equations for conservation of mass, momentum, species and energy in the melt. The equation for the evolution of n includes the effects of bubble growth, convection and nucleation; its derivation requires preliminary study of the growth and motion of an individual bubble in a liquid with a temperature gradient. With these equations, formulas for the mass flux of volatiles from the polymer surface and the bubble void fraction are developed, for the special case of constant polymer mass fraction. Author

N86-12351# IIT Research Inst., Chicago, Ill.
HYDRAULIC FLUIDS
In its Hazards of Chem. Rockets and Propellants, Vol. 3 Sep. 1984 12 p refs (For primary document see N86-12328 03-28)
Avail: Chemical Propulsion Information Agency, Johns Hopkins Road, Laurel, Md. 20707 HC $61.56 CSCL 07/4

N86-12352# IIT Research Inst., Chicago, Ill.
MERCURY
In its Hazards of Chem. Rockets and Propellants, Vol. 3 Sep. 1984 9 p refs (For primary document see N86-12328 03-28)
Avail: Chemical Propulsion Information Agency, Johns Hopkins Road, Laurel, Md. 20707 HC $61.56 CSCL 07/4

N86-12353# IIT Research Inst., Chicago, Ill.
COMPRESSED AND LIQUID AIR
In its Hazards of Chem. Rockets and Propellants, Vol. 3 Sep. 1984 8 p refs (For primary document see N86-12328 03-28)
Avail: Chemical Propulsion Information Agency, Johns Hopkins Road, Laurel, Md. 20707 HC $61.56 CSCL 07/4

N86-12354# IIT Research Inst., Chicago, Ill.
CARBON DIOXIDE
In its Hazards of Chem. Rockets and Propellants, Vol. 3 Sep. 1984 10 p refs (For primary document see N86-12328 03-28)
Avail: Chemical Propulsion Information Agency, Johns Hopkins Road, Laurel, Md. 20707 HC $61.56 CSCL 07/4

N86-12355# IIT Research Inst., Chicago, Ill.
NITROUS OXIDE
In its Hazards of Chem. Rockets and Propellants, Vol. 3 Sep. 1984 7 p refs (For primary document see N86-12328 03-28)
Avail: Chemical Propulsion Information Agency, Johns Hopkins Road, Laurel, Md. 20707 HC $61.56 CSCL 07/4

N86-12381# Tokyo Denki Univ. (Japan). Faculty of Engineering.
THE STUDIES ON THE EFFECTS OF INTERMOLECULAR HYDROGEN BOND IN MELAMINE RESINATION PROCESS. (METHYLATED MELAMINES WERE ADOPTED AS THE MODEL COMPOUNDS OF STARTING MATERIAL)
Moritaka Tajima *In its* Res. Rept. of the Faculty of Eng., Tokyo Denki Univ., No. 32 Dec. 1984 p 131-156 refs In JAPANESE; ENGLISH summary (For primary document see N86-12372 03-31)
Avail: NTIS HC A09/MF A01

N86-12453# Joint Publications Research Service, Arlington, Va.
USAGES OF ORGANIC MEMBRANES IN ELECTROLYTIC INDUSTRY DESCRIBED
Li Jisen *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-030) 4 Sep. 1985 p 25-35 refs Transl. into ENGLISH from Huaxue Tongbao (Beijing), no. 5, 18 May 1985 p 37-42 (For primary document see N86-12451 03-31)
Avail: NTIS HC A08/MF A01

26 METALLIC MATERIALS

Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

N86-12292*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
INFLUENCE OF LOAD INTERACTIONS ON CRACK GROWTH AS RELATED TO STATE OF STRESS AND CRACK CLOSURE
Jack Telesman Sep. 1985 22 p refs
(NASA-TM-87117; E-2724; NAS 1.15:87117) Avail: NTIS HC A02/MF A01 CSCL 11F

Fatigue crack propagation (FCP) after an application of a low-high loading sequence was investigated as a function of specimen thickness and crack closure. No load interaction effects were detected for specimens in a predominant plane strain state. However, for the plane stress specimens, initially high FCP rates after transition to a higher stress intensity range were observed. The difference in observed behavior was explained by examining the effect of the resulting closure stress intensity values on the effective stress intensity range. Author

N86-12293*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ELLIPSOMETRIC SURFACE ANALYSIS OF WEAR TRACKS PRODUCED BY DIFFERENT LUBRICANTS
James L. Lauer, Norbert Marxer, and William R. Jones, Jr. [Oct. 1985] 20 p refs Presented at the Tribology Conf., Atlanta, 8-10 Oct. 1985; sponsored by ASLE and ASME
(Grants NAG3-22; DAAG24-83-K-0058)
(NASA-TM-87142; E-2769; NAS 1.15:87142) Avail: NTIS HC A02/MF A01 CSCL 11H

A scanning ellipsometer with high spatial resolution was used to analyze wear tracks generated on M-50 surfaces operated in several lubricant formulations. These formulations included a pure ester base stock of trimethyol propane triheptanoate with additives of either benzotriazole (BTZ), dioctyldiphenylamine (DODPA), or tricresylphosphate (TCP). Results indicated that BTZ and TCP produced patchy oxide surface films consisting mainly of Fe304. DOPDA produced a much more uniform oxide film. These findings may explain the tendency of lubricant formulations containing TCP to scuff more readily than those containing only antioxidants.
Author

N86-12294*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
FATIGUE CRACK PROPAGATION OF NICKEL-BASE SUPERALLOYS AT 650 DEG C
J. Gayda, T. P. Gabb, and R. V. Miner [Oct. 1985] 22 p refs Presented at the Symp. on Low-Cycle Fatigue Directions for the Future, Bolton Landing, N.Y., 30 Sep. - 4 Oct. 1985; sponsored by American Society for Testing and Materials
(NASA-TM-87150; E-2778; NAS 1.15:87150) Avail: NTIS HC A02/MF A01 CSCL 11F

The 650 C fatigue crack propagation behavior of two nickel-base superalloys, Rene 95 and Waspaloy, is studied with particular emphasis placed on understanding the roles of creep, environment, and two key grain boundary alloying additions, boron and zirconium. Comparison of air and vacuum data shows the air environment to be detrimental over a wide range of frequencies for both alloys. More in-depth analysis on Rene 95 shows at lower frequencies, such as 0.02 Hz, failure in air occurs by intergranular, environmentally-assisted creep crack growth, while at higher frequencies, up to 5.0 Hz, environmental interactions are still evident but creep effects are minimized. The effect of B and Zr in Waspaloy is found to be important where environmental and/or creep interactions are presented. In those instances, removal of B and Zr dramatically increases crack growth and it is therefore plausible that effective dilution of these elements may explain a previously observed trend in which crack growth rates increase with decreasing grain size. Author

N86-12295*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
AN UPDATE OF THE TOTAL-STRAIN VERSION OF SRP
James F. Saltsman and Gary R. Halford Oct. 1985 27 p refs Presented at the Symp. on Low Cycle Fatigue: Direc. for the

Future, Lake George, N.Y., 30 Sep. - 4 Oct. 1985; sponsored by American Society for Testing and Materials, American Inst. of Mining, Metallurgical and Petroleum Engineers, and American Society for Metals
(NASA-TP-2499; E-2575; NAS 1.60:2499) Avail: NTIS HC A03/MF A01 CSCL 11F

An updated procedure for characterizing an alloy and predicting cyclic life by using the total strain range version of strainrange partitioning (TS-SRP) has been developed. The principal feature of this update is a new procedure for determining the intercept of time dependent elastic strain range versus cyclic life lines. The procedure is based on an established relation between failure and the cyclic stress-strain response of an alloy. The stress-strain response is characterized by empirical equations presented in this report. These equations were determined with the aid of a cyclic constitutive model. The procedures presented herein reduce the testing required to characterize an alloy. Failure testing is done only in the high strain, low life regime; cyclic stress-strain response is determined from tests conducted in both the high and low strain regimes. These tests are carried out to stability of the stress-strain hysteresis loop but not to failure. Thus both the time and costs required to characterize an alloy are greatly reduced. This approach was evaluated and verified for two nickel base superalloys, AF2-1DA and Inconel 718. Author

N86-12296# Johns Hopkins Univ., Baltimore, Md. Center for Materials Research.
RESEARCH ON THE MICROSTRUCTURE OF RAPIDLY SOLIDIFIED ALLOYS Progress Report
D. Shechtman, L. A. Bendersk, and E. Horowitz Jun. 1985 62 p
(Contract MDA903-83-K-0400)
(AD-A157077; CMR-DARPA-10) Avail: NTIS HC A04/MF A01 CSCL 11/6

The results of research performed on rapidly solidified alloys are presented. A major breakthrough by Shechtman is reported in the first paper on Al-Mn alloys with a metallic phase (icosahedral quasicrystal) with long range of orientational order and no translational symmetry. In addition, the microstructure and phases in other rapidly solidified alloys are discussed including variations in microstructure as a function of processing conditions. GRA

N86-12297# Pennsylvania State Univ., University Park. Dept. of Materials Science and Engineering.
EFFECT OF GRAIN BOUNDARY STRUCTURE ON SENSITIZATION AND CORROSION OF STAINLESS STEEL Annual Technical Report
B. W. Bennett and H. W. Pickering Jun. 1985 21 p
(Contract N00014-81-K-0025)
(AD-A157133) Avail: NTIS HC A02/MF A01 CSCL 11/6

This paper reports on a study of intergranular corrosion, particularly the influence of the crystallography of a grain boundary (g.b.) on the sensitization and grain boundary corrosion of stainless steels. Since sensitization of stainless steels depends on g.b. energy, this study included a determination of the misorientation angle of grain boundaries in a sample. A scanning electron microscope was modified for application of the electron backscattering (EBS) technique in conjunction with normal SEM imaging of the sample surface. In austenitic stainless steel (Fe-18Cr-10Ni) samples annealed at 1200 C for 1 hour, water quenched and aged for various times at 650 C, the degree of sensitization increased with increasing aging time. This was indicated by an increasing width of the g.b. groove. A plot of groove width vs. g.b. misorientation angle obtained by the EBS technique showed a range of groove crystallography and the coincident site lattice concept provided a rationalization of this observation. Similar results were found for ferritic stainless steel (Fe-19 Cr) samples. The Cr concentration profiles as a function of time were calculated, using a finite difference method, both along the g.b. and normal to the g.b. GRA

N86-12298# Naval Air Development Center, Warminster, Pa. Aircraft and Crew Systems Technology Directorate.
PROPERTIES OF A RETROGRESSED AND RE-AGED 7075 ALUMINUM ALLOY Progress Report
E. S. Tankins, V. S. Agarwala, C. E. Neu, and J. J. Bethke 31 Dec. 1984 47 p
(NR Proj. F61-542)
(AD-A157415; NADC-84096-60) Avail: NTIS HC A03/MF A01 CSCL 11/6

Retrogression and Re-aging (RRA) is a new thermal process introduced for the purpose of enhancing corrosion resistance of 7075-T651 aluminum alloy while maintaining its T6 strength. In this study a 7075 material so treated was investigated for its mechanical and corrosion resistant properties. Results indicated that the RRA treated 7075 was significantly better than the T6 temper in resistance to stress corrosion cracking and exfoliation corrosion. The loss in strength from RRA treatment was minimal. Electron microscopy of the fractured surface showed a distinct difference in the fracture mode when compared to the T6 temper condition. Tests results indicated that the RRA heat treatment resulted in fatigue and fracture toughness properties superior to the 7075-T651. GRA

N86-12299# Department of the Navy, Washington, D. C.
SUSPENSION METHOD OF IMPREGNATING ACTIVE MATERIAL INTO COMPOSITE NICKEL PLAQUE Patent Application
W. A. Ferrando, inventor (to Navy) Filed 29 May 1985 18 p
(AD-D011826; US-Patent-Appl-SN-740115) Avail: NTIS HC A02/MF A01 CSCL 09/1

A process is described for impregnating nickel or cadmium active material into a sintered nickel coated graphite fiber composite plaque electrode in which a suspension of 1-20 micron particles of active material in ethylene glycol in a 1:1 to 1:4 weight ratio of glycol to particles is gently worked into the plaque and the ethylene glycol is then evaporated off leaving the particles of active material distributed throughout the plaque. This procedure is repeated until the desired level of loading is achieved. Author (GRA)

N86-12300# Aluminum Co. of America, Alcoa Center, Pa.
RESISTANCE TO FRACTURE, FATIGUE AND STRESS-CORROSION OF Al-Cu-Li-Zr ALLOYS Final Report, 1 Jul. 1981 - 28 Feb. 1985
A. K. Vasudevan, R. C. Malcolm, W. G. Fricke, and R. J. Rioja 19 Feb. 1985 243 p Original contains color illustrations
(Contract N00019-80-C-0569)
(AD-A158407) Avail: NTIS HC A11/MF A01 CSCL 11/6

This investigation was undertaken to characterize the role of composition/microstructure on the mechanical behavior of Al-Cu-Li-Zr alloys. This characterization is intended to serve as a baseline data for alloy development work directed at improving the mechanical properties of Al-Li alloys. The report summarizes the results on fracture, fatigue and stress corrosion behavior of Al-Cu-Li-Zr alloys. GRA

N86-12301# Oak Ridge National Lab., Tenn.
PARAMAGNETIC FORM FACTORS OF HCP TRANSITION METALS
S. H. Liu, A. J. Liu, and J. F. Cooke Jun. 1985 11 p Presented at the Intern. Conf. on Magnetics, San Francisco, 26 Aug. 1985
(Contract DE-AC05-84OR-21400)
(DE85-016301; CONF-85089-0) Avail: NTIS HC A02/MF A01

Elastic neutron scattering experiments have provided accurate information about the Fourier transform of the total induced magnetization density which consists of orbital and spin contributions. Traditionally, one analyzes the orbital part by using the atomic model. Recently we have developed a numerical technique to compute accurately the orbital moment form factor of the itinerant electrons in cubic transition metals. We have now extended the calculation to HCP metals Sc, Y, Lu, and Zr. The calculated orbital contributions deviate from atomic orbital form factors. There is reasonable overall agreement between theory and experiments. DOE

N86-12302# Oak Ridge National Lab., Tenn.
EFFECT OF PULSED IRRADIATION ON MICROSTRUCTURAL EVOLUTION

N. H. Packan 1985 21 p Presented at the Workshop on the Relation Between Mech. Properties and Micro-Struct. Under Fusion Irradiation Conditions, Ebeltoft, Denmark, 27 Jun. 1985
(Contract DE-AC05-84OR-21400)
(DE85-016317; CONF-8506165-2) Avail: NTIS HC A02/MF A01

Discontinuous irradiation, such as could ensue from the operation of a magnetic fusion reactor, may cause changes in the development of radiation damage microstructures. In this paper, the experimental observations of such pulsing effects are collected and compared. Resulting trends are related to the implications of theoretical mechanisms. Conclusions are drawn on the degree to which pulsing seems capable of affecting the major aspects of radiation damage to metals. DOE

N86-12303# Oak Ridge National Lab., Tenn. National Center for Small Angle Scattering Research.
COMBINED SMALL ANGLE X-RAY SCATTERING AND TRANSMISSION ELECTRON MICROSCOPE STUDIES OF Al-Li ALLOYS
D. Spooner, D. B. Williams (Lehigh Univ., Bethlehem, Pa.), and C. M. Sung (Lehigh Univ., Bethlehem, Pa.) 1985 15 p refs
(Contract DE-AC05-84OR-21400; Grant NSF DMR-77-24459)
(DE85-016356; CONF-850777-2) Avail: NTIS HC A02/MF A01

Combined small angle X-ray scattering (SAXS) and transmission electron microscopy (TEM) studies have been performed on two binary Al-Li alloys subjected to different pre-aging treatments. Both the SAXS and TEM data indicate that DELTA' (Al_3Li) in samples of the two alloys directly quenched to the aging temperature is larger in size than in samples quenched to below room temperature prior to aging. SAXS data indicate an initial rise in scattering center size in Al-9.4 at% Li, which is not observed in the more dilute Al-6.8 at% Li, or in the TEM studies of DELTA' in both alloys. It is considered that these observations are evidence that the initial rise in the SAXS data in Al-9.4 at% Li alloys is due to a phenomenon other than DELTA' precipitation. The possibility of matrix spinodal decomposition in this alloy is one explanation.
Author

N86-12304# Oak Ridge National Lab., Tenn.
REVIEW OF EFFECTS OF LONG-TERM AGING ON THE MECHANICAL PROPERTIES AND MICROSTRUCTURES OF TYPES 304 AND 316 STAINLESS STEEL
J. A. Horak, V. K. Sikka, and D. T. Raske 1985 13 p refs Presented at the Intern. Conf. on Nucl. Power Plant Aging, Availability Factor and Reliability Anal., San Diego, Calif., 7 Jul. 1985 Prepared in cooperation with Argonne National Lab., Ill.
(Contract DE-AC05-84OR-21400)
(DE85-016472; CONF-850713-7) Avail: NTIS HC A02/MF A01

Because commercial liquid metal fast breeder reactors (LMFBR) are designed to last for 40 years or more, an understanding of the mechanical behavior of the structural alloys used in them is required for times on the order of 2.5 x 10 to the 5th power h (assuming a 70% availability factor). Types 304 and 316 stainless steel are used extensively in LMFBR systems. At the beginning of life these alloys are in a metastable state and evolve to a more stable state and, therefore, more stable microstructure during plant operation. Correlations of microstructures and mechanical properties during aging under representative LMFBR temperature and loading conditions are desirable from the standpoint of assuring safe, reliable, and economic plant operation. The mechanical properties and microstructures of types 304 and 316 stainless steel wrought alloys are reviewed after long-term aging in air for times up to 9 x 10 the 4th power h (about 10-1/2 years). The principal effect of such aging is to reduce low temperature fracture toughness (as measured by Charpy impact test) and tensile ductility. Examples are cited, however, where, because stable microstructures are achieved, these as well as strength-related properties can be expected to remain adequate for anticipated service life conditions. DOE

N86-12305# Sandia National Labs., Albuquerque, N. Mex.
SPECIAL METALLOGRAPHIC PROCEDURES FOR AUSTENITIC STAINLESS STEEL WELDS
M. J. Cieslak and M. E. McAllaster 1985 34 p Presented at the Intern. Metallog. Soc. Conf., Denver, 21 Jul. 1985
(Contract DE-AC04-76DP-00789)
(DE85-010113; SAND-85-0818C; CONF-850753-1) Avail: NTIS HC A03/MF A01

The interpretation of austenitic stainless steel weld metal microstructure requires an understanding of the solidification and solid state transformation metallurgy of this class of alloys. The room temperature microstructures are complicated by the fact that ferrite is only stable at high temperatures. The alloy composition and weld cooling rates can influence both the form and amount of ferrite present in the room temperature microstructure. Optical microscopy can be a valuable tool in studying both weld metal solidification and transformation mechanisms and the related problem of solidification hot-cracking. DOE

N86-12306# Department of Energy, Washington, D. C.
METHOD AND APPARATUS FOR CONDUCTING VARIABLE THICKNESS VAPOR DEPOSITION Patent Application
G. V. Nesslage, inventor (to DOE) Filed 3 Aug. 1984 12 p Prepared in cooperation with Mound Lab., Miamisburg, Ohio
(Contract DE-AC04-76DP-00053)
(DE85-011653; US-Patent-Appl-SN-637629) Avail: NTIS HC A02/MF A01

A method of vapor depositing metal on a substrate in variable thickness comprises conducting the deposition continuously without interruption to avoid formation of grain boundaries. To achieve reduced deposition in specific regions a thin wire or ribbon blocking body is placed between source and substrate to partially block vapors from depositing in the region immediately below. DOE

N86-12307# Ames Lab., Iowa.
EFFECTS OF MICROSTRUCTURE ON THE ACOUSTOELASTIC MEASUREMENTS OF STRESS
R. B. Thompson, J. F. Smith, and S. S. Lee 1983 9 p Presented at the AIME-ASM Fall Meeting, Philadelphia, 1 Oct. 1983
(Contract W-7405-eng-82)
(DE85-015518; IS-M-538; CONF-8310394-1) Avail: NTIS HC A02/MF A01

The acoustoelastic measurement of stress is based on deformation induced shifts in the ultrasonic velocity. Although changes in stress are routinely monitored, the absolute determination of stress in a part of unknown history is rendered difficult by competing microstructurally induced velocity shifts. A number of techniques to overcome this problem are first reviewed. A more detailed discussion is then given of a potential solution under investigation by the authors. This involves measuring the difference in the velocities of two shear waves whose directions of propagation and polarization have been interchanged. According to the theory of anisotropic elastic continua, the proportionality constant relating this velocity difference to stress should be only weakly dependent on microstructure. Preliminary measurements show that this prediction is followed in mildly anisotropic (rolled 6061 Al) and plastically deformed (1100 Al loaded beyond yield) metal polycrystals. Included is a discussion of more severe microstructural conditions which must be considered to establish the ultimate limits of the technique. DOE

N86-12308# Sandia National Labs., Albuquerque, N. Mex.
OPTICAL MEASUREMENTS OF SHOCK-INDUCED CHEMICAL REACTIONS IN MIXED ALUMINUM-NICKEL POWDER
M. B. Boslough, R. A. Graham, and D. M. Webb 1985 6 p Presented at the Am. Phys. Soc. Topical Conf. on Shock Waves in Condensed Matter, Spokane, 22 Jul. 1985
(Contract DE-AC04-76DP-00789)
(DE85-014705; SAND-85-0498C; CONF-850736-21) Avail: NTIS HC A02/MF A01

Optical pyrometer and high-speed photography experiments have been carried out to determine the temperature and temporal-spatial evolution of a chemical reaction zone in shock-loaded, nickel-aluminum powder mixtures. The temperature generated is about 5000 K, and the reaction occurs on a 100 nanosecond or faster time scale. Experimental results are compared to numerical

calculations, which suggest that there are threshold shock pressures and temperatures of about 15 GPa and 500 C which are required to initiate the strong exothermic reaction. Further, excessive pressure appears to inhibit reaction. This observation is in agreement with previous experiments in which nickel-aluminum alloys were recovered from shock-loaded mixtures. DOE

N86-12309# Nebraska Univ., Lincoln. Dept. of Chemistry.
STUDIES ON UNUSALLY REACTIVE METAL POWDERS: PREPARATION OF NEW ORGANOMETALLIC AND ORGANIC COMPOUNDS INCLUDING POTENTIAL NEW CATALYSTS Final Report, 1 Jul. 1989 - 31 Dec. 1984
R. D. Rieke Jun. 1985 18 p refs
(Contract DE-AC02-80ER-10603)
(DE85-014844; DOE/ER-10603/T3) Avail: NTIS HC A02/MF A01

This research project was involved with the preparation and study of highly reactive metal powders prepared by the reduction of metal salts with alkali metals. Studies concentrated on nickel, copper, cadmium, uranium, iron, and magnesium. The nickel powders have been found to react rapidly with benzylic halides, and the resulting organonickel complexes yield dibenzyl. Aryl halides react rapidly with the nickel powders to produce biaryl compounds in high yields. Benzylic halides react with the nickel powders in the presence of acylhalides to produce benzyl ketones in high yields. Reactions of ROCOCOC 1 and benzylic halides with nickel powders yield benzyl ketones. These reactions proceed with a wide variety of substituents on the phenyl ring of the benzylic halides. Highly reactive uranium has beeen prepared, and found to react with a variety of oxygen containing substrates, such as nitrobenzene to yield azo benzene. Highly reactive magnesium has opened up a totally new area of low temperature Grignard chemistry. The preparation of highly reactive copper has allowed the direct preparation of organocopper species directly from organic halides. DOE

N86-12429# Joint Publications Research Service, Arlington, Va.
TITANIUM EXTRACTANT T105-1 STUDIED
Mu Guangzhao *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-021) 8 Jul. 1985 p 141-144 Transl. into ENGLISH from Huaxue Shijie (Shanghai), v. 26, no. 3, 20 Mar. 1985 p 82-83 (For primary document see N86-12421 03-31)
Avail: NTIS HC A09/MF A01

N86-12467# Joint Publications Research Service, Arlington, Va.
IRON AND STEELMAKING WITH PLASMA
Yu Dingfu *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-032) 19 Sep. 1985 p 71-84 refs Transl. into ENGLISH from Gangtie (Beijing), v. 20, no. 5, May 1985 p 48-54 (For primary document see N86-12462 03-31)
Avail: NTIS HC A08/MF A01

27 NONMETALLIC MATERIALS

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.

N86-12310*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
MOLTEN SALT CORROSION OF SiC: PITTING MECHANISM
N. S. Jacobson and J. L. Smialek [Oct. 1985] 12 p refs Presented at the 168th Meeting of the Electrochem. Soc., Las Vegas, Nev., 13-18 Oct. 1985
(NASA-TM-87143; E-2770; NAS 1.15:87143) Avail: NTIS HC A02/MF A01 CSCL 11G

Thin films of Na2SO4 and Na2CO3 at 1000 C lead to severe pitting of sintered alpha-SiC. These pits are important as they cause a strength reduction in this material. The growth of product layers is related to pit formation for the Na2CO3 case. The early reaction stages involve repeated oxidation and dissolution to form sodium silicate. This results in severe grain boundary attack. After this a porous silica layer forms between the sodium silicate melt and the SiC. The pores in this layer appear to act as paths for the melt to reach the SiC and create larger pits. Author

N86-12311*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
STRUCTURE-TO-GLASS TRANSITION TEMPERATURE RELATIONSHIPS IN HIGH TEMPERATURE STABLE CONDENSATION POLYIMIDES
William B. Alston and Roy F. Gratz (Mary Washington Coll., Fredericksburg, Va.) [1985] 19 p refs Presented at the 2nd Intern. Conf. on Polyimides, Ellenville, N.Y., 30 Oct. - 1 Nov. 1985; sponsored by the Society of Plastics Engineers, Inc.
(DA Proj. 1L1-61101-AH-45)
(NASA-TM-87113; E-2714; NAS 1.15:87113; USAAVSCOM-TR-85-C-18) Avail: NTIS HC A02/MF A01 CSCL 11B

The presence of a hexafluoroisopropylidene (6F) connecting group in aryl dianhydrides used to prepare aromatic condensation polyimides provides high glass transition temperature (T sub g) polyimides with excellent thermo-oxidative stability. The purpose of this study was to determine if a trifluorophenyl-ethylidene (3F) connecting group would have a similar effect on the T sub g of aromatic condensation polyimides. A new dianhydride containing the 3F connecting group was synthesized. This dianhydride and an aromatic diamine also containing the 3F connecting group were used together and in various combinations with known diamines or known dianhydrides, respectively, to prepare new 3F containing condensation polyimides. Known polyimides, including some with the 6F connecting linkage, were also prepared for comparison purposes. The new 3F containing polymers and the comparison polymers were prepared by condensation polymerization via the traditional amic-acid polymerization method in N,N-dimethylacetamide solvent. The solutions were characterized by determining their inherent viscosities and then were thermally converted into polyimide films under nitrogen atmosphere at 300 to 500 C, usually 350 C. The T sub g's of the films and resin discs were then determined by thermomechanical analysis and were correlated as a function of the final processing temperatures of the films and resin discs. The results showed that similarities existed in the T sub g's depending on the nature of the connecting linkage in the monomers used to prepare the condensation polyimides. B.W.

N86-12312# Solarex Corp., Rockville, Md.
SEMICRYSTALLINE CASTING PROCESS DEVELOPMENT AND VERIFICATION Final Report, 19 Jun. 1980 - 28 Feb. 1984
Feb. 1984 264 p refs
(Contract DE-FC01-80ET-23197)
(JPL-9950-1160; DOE/JPL-ET-23197) Avail: NTIS HC A12/MF A01

The development of the polycrystalline silicon ingot technology employing the ubiquitous crystallization process (UCP) is discussed. The key elements of the program are to: (1) demonstrate the technical viability of large grain polycrystalline silicon wafers and their compatibility with all industrial requirements for fabrication of efficient solar cells; (2) demonstrate the compatibility of the process economics with low-cost array production and with 1982 and 1986 price goals; (3) verify process and equipment performance at high throughput levels, demonstrating readiness for commercialization. It is shown that semicrystalline silicon production by the UCP is a viably technology. The technical feasibility of producing large quantities of high quality sheet silicon is demonstrated. E.A.K.

N86-12313*# National Aeronautics and Space Administration, Washington, D. C.
MOLECULAR CONTROL
1985 69 p Prepared in cooperation with Naval Air Systems Command, Washington, D.C.
(NASA-TM-87510; NAS 1.15:87510; AD-A156709) Avail: NTIS HC A04/MF A01 CSCL 07C

In the first two chapters, the fundamental physics both existing

and required are described. Chapter 1 is the most theoretical of the chapters and introduces the theoretical platform. Chapter 2 and especially Chapter 3 moves the reader along to consider the applications of the theoretical platform to along to consider the applications of the theoretical platform to molecular dynamics and devices. Chapter 3 points out the need to extend some theoretical methods of physics itself in order to deal with the applied problems. Theoretical analyses which are necessary but require considerable time to develop and bring to engineering fruition are described in these first three chapters. Chapter 4 introduces the study of specific polymer systems, namely proteins, and Chapter 5 consides the broader area of polymer science and a specific example of energy harvesting. In Chapter 6 there is progress toward the applied with the introduction of the important field of enzyme mimics. Chapters 7 and 8 discuss basic science issues of enzymatic function. Chapters 9 and 10 define precise avenues of approach to obtaining enzyme control and also indicate the difficulties and complexities. Chapter 11 brings the reader down-to-earth to the practical and short-term requirements of bio-organic synthesis control. Chapter 12 addresses the pressing need for research and training, in general, in Polymer Science. GRA

N86-12314# Army Construction Engineering Research Lab., Champaign, Ill.
FULL-SCALE FIRE TESTS OF POLYURETHANE FOAM DOME STRUCTURES Final Report
L. A. Hrdina Jun. 1985 22 p
(DA Proj. 4A1-62731-AT-41)
(AD-A157107; CERL-TR-M-85/17) Avail: NTIS HC A02/MF A01 CSCL 11/9

This report documents research to determine the behavior and performance of uncoated rigid polyurethane foam (PUF) and of PUF coated with thermal barrier materials in full-scale fires on foam dome structures. Six PUF dome structures were tested for compliance with specified fire criteria and the results evaluated. The research showed that the coated structures complied with specific Department of Defense fire safety criteria, and furthermore that such a coating is necessary to prevent rapid spread of fire. Since the geometry of the test room apparently has no effect on a structure's ignitability or on the spread of fire, it was also concluded that reasonably fire-resistant structures may be built of PUF for housing during mobilization. Author (GRA)

N86-12315# Dayton Univ., Ohio. Dept. of Mathematics.
STATISTICAL TREATMENT OF ARAMID/EPOXY STRESS-RUPTURE DATA Final Report, 15 Feb. - 30 Apr. 1984
G. Shaughnessy Apr. 1985 17 p
(Contract F33615-82-C-5089)
(AD-A157238; AFWAL-TR-85-4001) Avail: NTIS HC A02/MF A01 CSCL 11/4

The purpose of this report is to provide statistically derived tabular design data to predict the estimated stress-rupture life of unidirectional aramid/epoxy composites subjected to sustained tensile loading. The maximum likelihood estimated life (MLEL) is tabulated for various stress levels of the fiber stress and quantile levels. The estimated lifetimes were calculated from accelerated stress-rupture tests of T.T. Chiao, who used uniaxial strand samples; therefore, the estimated lifetimes reported are considered to be conservative. GRA

N86-12316# Akron Univ., Ohio. Inst. of Polymer Science.
ROLE OF CHEMICAL BONDING IN ADHESION Final Report, Mar. 1977 - Oct. 1984
A. N. Gent and P. Dreyfuss Jun. 1985 16 p
(Contract N00014-76-C-0408)
(AD-A157251) Avail: NTIS HC A02/MF A01 CSCL 11/10

This project was concerned with the principal factors that govern the strength of elastomers when filled with rigid particles. The factors studied were: the level of adhesion between the elastomer and the rigid surface; the size and number of the rigid inclusions; and, the strength of the elastomer itself. GRA

N86-12317# Naval Academy, Annapolis, Md. Dept. of Physics.
HIGH PRESSURE AND MOLECULAR WEIGHT VARIATION OF ELECTRICAL RELAXATION IN POLY(ETHYLENE OXIDE) Interim Technical Report
J. J. Fontanella and M. C. Wintersgill Jun. 1985 32 p
(AD-A157660; TR-15) Avail: NTIS HC A03/MF A01 CSCL 07/4

Vacuum audio frequency complex admittance measurements have been performed on poly(ethylene oxide) using a fully automated dielectric spectrometer. Measurements have been made over the temperature range 5.5-320 K for molecular weights from 18,500 to 4,000,000. The gamma relaxation is essentially unchanged over the range of molecular weights studied. This represents evidence against assigning the gamma relaxation to the motion of end groups. Next, previously reported data for the gamma relaxation is reanalyzed using a reduced plot. The activation volume is found to be 3-4 cc/mol in good agreement with previous work and the small value implies that the relaxation is associated with the motion of very small segments of the polymer chain. Next, the relaxation associated with the glass transition, alpha subscript a, is only observed in temperature for some samples but is observed in both frequency and temperature for others. The strength of alpha subscript a decreases monotonically as molecular weight decreases. Finally, alpha subscript a was studied up to pressures of about 0.2 GPa for 5,000,000 molecular weight material. The results for the shift of alpha subscript a with pressure are in qualitative agreement with recent theories. GRA

N86-12318# Department of the Navy, Washington, D. C.
EPOXY PHTHALONITRILE POLYMERS Patent Application
T. M. Keller, inventor (to Navy) Filed 28 Jun. 1985 15 p
(AD-D011821; US-Patent-Appl-SN-749705) Avail: NTIS HC A02/MF A01 CSCL 11/9

A bisorthodinitrile monomer and an epoxy monomer are mixed with or without an amine curing agent and heated to a temperature sufficient to induce polymerization. The resulting epoxy-phthalonitrile copolymer has improved properties relative to the epoxy polymers including higher thermal and oxidative stability, higher glass transition temperatures, better shelf life, lower water absorptivity, and better electrical properties. The properties of the epoxy-phthalonitrile copolymer can be varied by varying the epoxy:phthalonitrile ratio. GRA

N86-12319# Pennsylvania State Univ., University Park. Dept. of Electrical Engineering.
EVALUATION OF HIGH PERMITTIVITY GLASS CERAMICS FOR MILLIMETER WAVE APPLICATIONS Final Report, 1 Dec. 1981 - 30 Nov. 1984
J. Perison, W. A. Schulze, L. E. Cross, A. Bhalla, and S. Swartz 11 May 1985 40 p
(Contract DAAG29-82-K-0015)
(AD-A158551; ARO-18209.2-PH) Avail: NTIS HC A03/MF A01 CSCL 20/3

The crystallization and dielectric properties of strontium titanate aluminosilicate glass-ceramics, containing perovskite SrTiO3 as the primary crystalline phase, have been investigated. The majority of this research was concentrated on glass-ceramics consisting of 65 wt% of SrTiO3 and 35 wt% of silica and alumina with a silica/alumina weight ratio of 2/1 (SAR-2). In glass-ceramics of this composition, the primary crystalline phase was perovskite SrTiO3; other crystalline phases included SrAl2Si2O8 (hexacelsian and anorthite) and TiO2 (anatase and rutile). The relative amounts of SrTiO3 and the other crystalline phases, and the microstructure, were a strong function of the crystallization conditions. The dielectric properties of SAR-2 glass-ceramics were extremely sensitive to the amount of SrTiO3 in the glass-ceramic, and thus to the crystallization conditions. Room temperature dielectric constants of the glass-ceramics ranged from 13 to 47. The dielectric constant increased as the crystallization temperature or time was increased, and peaks developed in the dielectric constant at low temperatures. These dielectric constant peaks were not due to dielectric mixing, and it was proposed that the peaks resulted

from ferroic domains in the SrTiO3, possibly caused by an interaction of the SrTiO3 crystallites with the matrix. GRA

N86-12320# Allied Bendix Corp., Kansas City, Mo.
THERMALLY INDUCED FAILURES OF THICK-FILM GLAZE RESISTORS
M. S. Raffety and W. D. Tuchig May 1985 20 p Presented at the 35th Electron. Components Conf., Washington, D.C., 20 May 1985
(Contract DE-AC04-76DP-00613)
(DE85-012014; BDX-613-3230; CONF-850599-2) Avail: NTIS HC A02/MF A01

Thick-film glaze resistors are particularly attractive for use in environments subject to extreme changes in temperature because of their low TCR values. Recently, however, it has been shown these resistors may fail when they are subjected to extended temperature cycling. The failures are characterized by increasing resistance with cycling and may ultimately culminate in a completely open condition. Examination of the failed components using a scanning electron microscope revealed the presence of cracks in the resistive glaze. The microstructural origin and propagation of these cracks are discussed in terms of an elastic model, and solutions to the problem of thermal cycling failure are proposed. DOE

N86-12321# Oak Ridge National Lab., Tenn.
CARBOTHERMAL SYNTHESIS OF SILICON CARBIDE
M. A. Janney, G. C. Wei, C. R. Kennedy, and I. A. Harris May 1985 60 p refs
(Contract DE-AC05-84OR-21400)
(DE85-013546; ORNL-6169) Avail: NTIS HC A04/MF A01

Silicon carbide powders were synthesized from various silica and carbon sources by a carbothermal reduction process at temperatures between 1500 and 1600 C. The silica sources were fumed silica, methyltrimethoxysilane, and microcrystalline quartz. The carbon sources were petroleum pitch, phenolic resins, sucrose, and carbon black. Submicron SiC powders were synthesized. Their morphologies included equiaxed loosely-bound agglomerates, equiaxed hard-shell agglomerates, and whiskers. Morphology changes with the furnance atmosphere (argon, nitrogen, or nitrogen-4% hydrogen). The best sintering was observed in SiC derived from the fumed-silica-pitch and fumed silica-sucrose precursors. The poorest sintering was observed in SiC derived from microcrystalline quartz and carbon black. DOE

N86-12322# Lawrence Livermore National Lab., Calif.
HIGH DAMAGE THRESHOLD POROUS SILICA ANTIREFLECTIVE COATING
I. M. Thomas, J. G. Wilder, W. H. Lowdermilk, and M. C. Staggs 25 Apr. 1985 11 p refs Presented at the Damage Symp., Boulder, Colo., 15 Oct. 1984
(Contract W-7405-eng-48)
(DE85-012924; UCRL-91428; CONF-8410276-2) Avail: NTIS HC A02/MF A01

A quarterwave-thick, narrow-bandwidth, antireflective coating for fused silica optical components and KDP crystals was developed. The coating consists of porous silica prepared from a silica sol in ethanol. It is applied by dip or spin from a aolution at room temperature and requires no further treatment. The damage threshold levels are about equal to the surface damage thresholds of the uncoated substrates. DOE

N86-12323# Language Services, Nashville, Tenn.
MANUFACTURING PROCESS FOR CYLINDRICAL CERAMIC TUBES WITH LOCALIZED IMPRINTS AND DEVICE FOR APPLICATION OF THIS PROCESS
[1985] 27 p Transl. into ENGLISH of French Patent no. 78-33445 (27 Nov. 1978)
(Contract DE-AC05-84OT-21400)
(DE85-012294; K-Trans-297) Avail: NTIS HC A03/MF A01

This invention involves a process for manufacturing permeable cylindrical ceramic tubes with localized relief such as annular, spiral or simple coiled or double crossed coils or even stipple imprints on their internal face. It is known that one of the techniques for the separation of the mixture of gases with close molecular masses is gaseous diffusion. According to this technique, the gas mixture is circulated under pressure inside tubes constituted by a microporous wall. These tubes, according to a known technique, are constituted by a macroporous ceramic tube, generally called a support, covered on the inside with a microporous layer deposited on this interior wall. The unit constituted by the tube itself or the support and the microporous layer makes it possible to adapt the total porosity of the covered tube or barrier in order to obtain an optimal coefficient of gas separation. This technique is used specifically for separation of two gases corresponding to various isotopes of the same simple body. DOE

N86-12324# Sandia National Labs., Albuquerque, N. Mex.
SURFACE CRYSTALLIZATION ON METALLIZED 94 PERCENT ALUMINA CERAMICS
J. R. Hellmann, W. R. Sorenson, M. J. Carr, and T. J. Headley 1985 13 p Presented at the Joint Meeting of the Electron Microscopy Soc. of Am. and the Microbeam Anal. Soc., Louisville, Ky., 5 Aug. 1985
(Contract DE-AC04-76DP-00789)
(DE85-008691; SAND-85-0500C; CONF-850840-1) Avail: NTIS HC A02/MF A01

Fabrication of 94% alumina (Wesgo AL500:94% (ALPHA) - Al2O3, balance SiO2-MgO-CaO glass) ceramic-to-metal seals involves metallization and nickel plating of the ceramic surface before brazing to the metal. To obtain a satisfactory joint, the metallized layer must be nickel plated for it to be wetted by the braze alloy. The strength and hermeticity of these seals are occasionally compromised by formation of an acicular reaction product on the metallized surface of the ceramic prior to plating. This reaction phase is electrically nonconductive and inhibits uniform nickel plating. In this study a variety of electro-optical techniques is integrated to indentify the structure and composition of this deleterious acicular phase and deduce how it forms; a means to retard its formation is suggested. DOE

N86-12325# Pacific Northwest Lab., Richland, Wash.
FIXATION OF HIGH-LEVEL WASTES IN GLASSES
J. E. Mendel May 1985 37 p Presented at the Discussion Meeting on Radioactive Waste Disposal, London, 30 May 1985
(Contract DE-AC06-76RL-01830)
(DE85-013276; PNL-SA-12921; CONF-850559-1) Avail: NTIS HC A03/MF A01

The early work that led to the selection of borosilicate glass for high-level waste disposal is described, and the important properties of borosilicate glass as they are now understood are reviewed. DOE

N86-12326# Mound Lab., Miamisburg, Ohio.
IN-SITU VACUUM-ASSISTED MOLDING OF GLASS-METAL ELECTRICAL COMPONENTS
D. P. Kramer and R. T. Massey 12 Jul. 1985 10 p
(Contract DE-AC04-76DP-00053)
(DE85-015607; MLM-3267) Avail: NTIS HC A02/MF A01

In-situ vacuum-assisted molding is an innovative processing technique, which is useful in the fabrication of complex glass or glass-ceramic-to-metal seals. During in-situ vacuum-assisted molding, molten glass is pulled with vacuum onto the metal parts, allowing the formation of the seal. The process improves glass flow, facilitates the removal of trapped gases, and makes possible the fabrication of seals of complex geometry. DOE

N86-12327# University of Southern California, Los Angeles.
DEPOSITION, MICROSTRUCTURE AND PROPERTIES OF LASER CVD SiC FILMS
S. D. Allen, S. M. Copley, R. H. Edwards, and F. Shaapur 1985 59 p
(Contract DE-FG03-84ER-45093)
(DE85-014680; DOE/ER-45093/T1) Avail: NTIS HC A04/MF A01

A nonlinear numerical integration computer code for the

prediction of the laser generated surface temperature distribution in the LCVD substrate has been developed in support of the experimental measurements. Additionally, deposition initiation and rates in LCVD for various deposit/substrate/laser systems were measured and correlated with theoretically calculated laser heated surface temperature profiles. This numerical integration technique, however, needs further modifications to match our SiC/substrate/laser systems specifications. Theoretical investigation of transport effects including convective and diffusive processes influence on the LCVD film growth characteristics is currently in progress. DOE

N86-12380# Tokyo Denki Univ. (Japan). Faculty of Engineering.
STUDY ON ELECTROPAINTING USING ALKOXYMETHYLMELAMINE AS CROSSLINKING AGENT
R. Shiba, M. Takahashi, H. Yoneyama, and M. Tajima *In its* Res. Rept. of the Faculty of Eng., Tokyo Denki Univ., No. 32 Dec. 1984 p 117-130 refs In JAPANESE; ENGLISH summary (For primary document see N86-12372 03-31)
Avail: NTIS HC A09/MF A01

N86-12773*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
GLASS BREAKING STRENGTH: THE ROLE OF SURFACE FLAWS AND TREATMENTS
Donald Moore *In its* Reliability and Eng. of Thin-Film Photovoltaic Modules 1 Oct. 1985 p 235-248 (For primary document see N86-12759 03-44)
Avail: NTIS HC A13/MF A01 CSCL 11B

28 PROPELLANTS AND FUELS

Includes rocket propellants, igniters, and oxidizers; storage and handling; and aircraft fuels.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power,* and *44 Energy Production and Conversion.*

N86-12328# IIT Research Inst., Chicago, Ill. Chemical Propulsion Information Agency.
HAZARDS OF CHEMICAL ROCKETS AND PROPELLANTS. VOLUME 3: LIQUID PROPELLANTS Manual, 1 Jan. 1977 - 30 Jun. 1985
John A. E. Hannum, ed. 30 Jun. 1985 547 p refs 3 Vol.
(Contracts F04611-82-C-0007; N00024-83-C-5301)
(AD-A158115; CPIA-Publ-394-Vol-3) Avail: Chemical Propulsion Information Agency, Johns Hopkins Road, Laurel, Md. 20707 HC $61.56 CSCL 19/1

This manual in three volumes was prepared under the auspices of the Joint Army-Navy-NASA-Air Force (JANNAF) Interagency Propulsion Committee through the Safety and Environmental Protection Subcommittee. It is intended solely as a source of information and as a set of basic guidelines for the processing, handling, storage, and transportation of chemical rocket and gun propellants and propellant ingredients. The manual consists of three volumes, of which this is the third: Volume 1-Safety Health and the Environment; Volume 2-Solid Propellants and Ingredients; Volume 3-Liquid propellants. For individual titles, see N86-12329 through N86-12357.

N86-12329# IIT Research Inst., Chicago, Ill.
HYDROCARBON FUELS
In its Hazards of Chem. Rockets and Propellants, Vol. 3 Sep. 1984 32 p refs (For primary document see N86-12328 03-28)
Avail: Chemical Propulsion Information Agency, Johns Hopkins Road, Laurel, Md. 20707 HC $61.56 CSCL 21/9

Hydrocarbon fuels are liquid rocket propellant components. Their physical and chemical properties are listed, including specifications of commercial examples. A guideline for their safe processing, handling, storage, and transportation is given. Emergency procedures to be taken in the event of accidental spills or leaks are also given. F.M.R.

N86-12330# IIT Research Inst., Chicago, Ill.
ANHYDROUS AMMONIA
In its Hazards of Chem. Rockets and Propellants, Vol. 3 Sep. 1984 16 p refs (For primary document see N86-12328 03-28)
Avail: Chemical Propulsion Information Agency, Johns Hopkins Road, Laurel, Md. 20707 HC $61.56 CSCL 21/9

Anhydrous ammonia is a liquid rocket propellant component. Its physical and chemical properties are listed. A guideline for its safe processing, handling, storage, and transportation is given. Emergency procedures to be taken in the event of accidental spills or leaks are also given. F.M.R.

N86-12331# IIT Research Inst., Chicago, Ill.
THE HYDRAZINE FUELS
In its Hazards of Chem. Rockets and Propellants, Vol. 3 Sep. 1984 26 p refs (For primary document see N86-12328 03-28)
Avail: Chemical Propulsion Information Agency, Johns Hopkins Road, Laurel, Md. 20707 HC $61.56 CSCL 21/9

Hydrazine fuel is a liquid rocket propellant component. Its physical and chemical properties are listed. A guideline for its safe processing, handling, storage, and transportation is given. Emergency procedures to be taken in the event of accidental spills or leaks are also given. F.M.R.

N86-12332# IIT Research Inst., Chicago, Ill.
NITROMETHANE
In its Hazards of Chem. Rockets and Propellants, Vol. 3 Sep. 1984 12 p refs (For primary document see N86-12328 03-28)
Avail: Chemical Propulsion Information Agency, Johns Hopkins Road, Laurel, Md. 20707 HC $61.56 CSCL 21/9

Nitromethane is a liquid rocket propellant component. Its physical and chemical properties are listed. A guideline for its safe processing, handling, storage, and transportation is given. Emergency procedures to be taken in the event of accidental spills or leaks are also given. F.M.R.

N86-12333# IIT Research Inst., Chicago, Ill.
ETHYLENE OXIDE
In its Hazards of Chem. Rockets and Propellants, Vol. 3 Sep. 1984 15 p refs (For primary document see N86-12328 03-28)
Avail: Chemical Propulsion Information Agency, Johns Hopkins Road, Laurel, Md. 20707 HC $61.56 CSCL 21/9

Ethylene oxide is a liquid rocket propellant component. Its physical and chemical properties are listed. A guideline for its safe processing, handling, storge, and transportation is given. Emergency procedures to be taken in the event of accidental spills or leaks are also given. F.M.R.

N86-12334# IIT Research Inst., Chicago, Ill.
OTTO FUEL 2
In its Hazards of Chem. Rockets and Propellants, Vol. 3 Sep. 1984 12 p refs (For primary document see N86-12328 03-28)
Avail: Chemical Propulsion Information Agency, Johns Hopkins Road, Laurel, Md. 20707 HC $61.56 CSCL 21/9

Otto Fuel 2 is a liquid rocket propellant component. Its physical and chemical properties are listed. A guideline for its safe processing, handling, storage, and transportation is given. Emergency procedures to be taken in the event of accidental spills or leaks are also given. F.M.R.

N86-12335# IIT Research Inst., Chicago, Ill.
HYDROGEN AND DEUTERIUM
In its Hazards of Chem. Rockets and Propellants, Vol. 3 Sep. 1984 13 p refs (For primary document see N86-12328 03-28)
Avail: Chemical Propulsion Information Agency, Johns Hopkins Road, Laurel, Md. 20707 HC $61.56 CSCL 21/9

Hydrogen and deuterium are liquid rocket propellant components. Their physical and chemical properties are listed. A guideline for their safe processing, handling, storage, and transportation is given. Emergency procedures to be taken in the event of accidental spills or leaks are also given. F.M.R.

N86-12336# IIT Research Inst., Chicago, Ill.
THE BORANES
In its Hazards of Chem. Rockets and Propellants, Vol. 3 Sep. 1985 18 p refs (For primary document see N86-12328 03-28)
Avail: Chemical Propulsion Information Agency, Johns Hopkins Road, Laurel, Md. 20707 HC $61.56 CSCL 21/9

Diborane and pentaborane are liquid rocket propellant components. Their physical and chemical properties are listed. A guideline for its safe processing, handling, storage, and transportation is given. Emergency procedures to be taken in the event of accidental spills or leaks are also given. F.M.R.

N86-12337# IIT Research Inst., Chicago, Ill.
CARBON MONOXIDE
In its Hazards of Chem. Rockets and Propellants, Vol. 3 Sep. 1984 8 p refs (For primary document see N86-12328 03-28)
Avail: Chemical Propulsion Information Agency, Johns Hopkins Road, Laurel, Md. 20707 HC $61.56 CSCL 21/9

Carbon monoxide is a liquid rocket propellant component. Its physical and chemical properties are listed. A guideline for its safe processing, handling, storage, and transportation is given. Emergency procedures to be taken in the event of accidental spills or leaks are also given. F.M.R.

N86-12338# IIT Research Inst., Chicago, Ill.
OXYGEN
In its Hazards of Chem. Rockets and Propellants, Vol. 3 Sep. 1984 11 p refs (For primary document see N86-12328 03-28)
Avail: Chemical Propulsion Information Agency, Johns Hopkins Road, Laurel, Md. 20707 HC $61.56 CSCL 21/9

Liquid oxgyen is a liquid rocket propellant component. Its physical and chemical properties are listed. A guideline for its safe processing, handling, storage, and transportation is given. Emergency procedures to be taken in the event of accidental spills or leaks are also given. F.M.R.

N86-12339# IIT Research Inst., Chicago, Ill.
FLUORINE AND FLUORINE MIXTURES
In its Hazards of Chem. Rockets and Propellants, Vol. 3 Sep. 1984 18 p refs (For primary document see N86-12328 03-28)
Avail: Chemical Propulsion Information Agency, Johns Hopkins Road, Laurel, Md. 20707 HC $61.56 CSCL 21/9

Fluorine and FLOX are liquid rocket propellant components. Their physical and chemical properties are listed. A guideline for its safe processing, handling, storage, and transportation is given. Emergency procedures to be taken in the event of accidental spills or leaks are also given. F.M.R.

N86-12340# IIT Research Inst., Chicago, Ill.
THE HALOGEN FLUORIDES
In its Hazards of Chem. Rockets and Propellants, Vol. 3 Sep. 1984 16 p refs (For primary document see N86-12328 03-28)
Avail: Chemical Propulsion Information Agency, Johns Hopkins Road, Laurel, Md. 20707 HC $61.56 CSCL 21/9

Chlorine fluorides are liquid rocket propellant components. Their physical and chemical properties are listed. A guideline for their safe processing, handling, storage, and transportation is given. Emergency procedures to be taken in the event of accidental spills or leaks are also given. F.M.R.

N86-12341# IIT Research Inst., Chicago, Ill.
NITROGEN OXIDES
In its Hazards of Chem. Rockets and Propellants, Vol. 3 Sep. 1984 17 p refs (For primary document see N86-12328 03-28)
Avail: Chemical Propulsion Information Agency, Johns Hopkins Road, Laurel, Md. 20707 HC $61.56 CSCL 21/9

Nitrogen oxides are liquid rocket propellant components. Their physical and chemical properties are listed. A guideline for their safe processing, handling, storage, and transportation are given. Emergency procedures to be taken in the event of accidental spills or leaks are also given. F.M.R.

N86-12342# IIT Research Inst., Chicago, Ill.
FUMING NITRIC ACIDS
In its Hazards of Chem. Rockets and Propellants, Vol. 3 Sep. 1984 16 p refs (For primary document see N86-12328 03-28)
Avail: Chemical Propulsion Information Agency, Johns Hopkins Road, Laurel, Md. 20707 HC $61.56 CSCL 21/9

Fuming nitric acids are liquid rocket propellant components. Their physical and chemical properties are listed. A guideline for their safe processing, handling, storage, and transportation is given. Emergency procedures to be taken in the event of accidental spills or leaks are also given. F.M.R.

N86-12343# IIT Research Inst., Chicago, Ill.
IODINE
In its Hazards of Chem. Rockets and Propellants, Vol. 3 Sep. 1984 7 p refs (For primary document see N86-12328 03-28)
Avail: Chemical Propulsion Information Agency, Johns Hopkins Road, Laurel, Md. 20707 HC $61.56 CSCL 21/9

Iodine is a liquid rocket propellant component. Its physical and chemical properties are listed. A guideline for its safe processing, handling, storage, and transportation is given. Emergency procedures to be taken in the event of accidental spills or leaks are also given. F.M.R.

N86-12344# IIT Research Inst., Chicago, Ill.
CHLORINE
In its Hazards of Chem. Rockets and Propellants, Vol. 3 Sep. 1984 11 p refs (For primary document see N86-12328 03-28)
Avail: Chemical Propulsion Information Agency, Johns Hopkins Road, Laurel, Md. 20707 HC $61.56 CSCL 21/9

Chlorine is a liquid rocket propellant component. Its physical and chemical properties are listed. A guideline for its safe processing, handling, storage, and transportation is given. Emergency procedures to be taken in the event of accidental spills or leaks are also given. F.M.R.

N86-12345# IIT Research Inst., Chicago, Ill.
NITROGEN TRIFLUORIDE
In its Hazards of Chem. Rockets and Propellants, Vol. 3 Sep. 1984 17 p refs (For primary document see N86-12328 03-28)
Avail: Chemical Propulsion Information Agency, Johns Hopkins Road, Laurel, Md. 20707 HC $61.56 CSCL 21/9

Nitrogen trifluoride is a liquid rocket propellant component. Its physical and chemical properties are listed. A guideline for its safe processing, handling, storage, and transportation is given. Emergency procedures to be taken in the event of accidental spills or leaks are also given. F.M.R.

N86-12346# IIT Research Inst., Chicago, Ill.
HYDROGEN PEROXIDE
In its Hazards of Chem. Rockets and Propellants, Vol. 3 Sep. 1983 19 p refs (For primary document see N86-12328 03-28)
Avail: Chemical Propulsion Information Agency, Johns Hopkins Road, Laurel, Md. 20707 HC $61.56 CSCL 21/9

Hydrogen peroxide is a liquid rocket propellant component. Its physical and chemical properties are listed. A guideline for its safe processing, handling, storage, and transportation is given. Emergency procedures to be taken in the event of accidental spills or leaks are also given. F.M.R.

N86-12347# IIT Research Inst., Chicago, Ill.
NITROGEN
In its Hazards of Chem. Rockets and Propellants, Vol. 3 Sep. 1984 11 p refs (For primary document see N86-12328 03-28)
Avail: Chemical Propulsion Information Agency, Johns Hopkins Road, Laurel, Md. 20707 HC $61.56 CSCL 21/9

Nitrogen is a liquid rocket propellant component. Its physical and chemical properties are listed. A guideline for its safe processing, handling, storage, and transportation is given. Emergency procedures to be taken in the event of accidental spills or leaks are also given. F.M.R.

N86-12348# IIT Research Inst., Chicago, Ill.
NOBLE GASES
In its Hazards of Chem. Rockets and Propellants, Vol. 3 Sep. 1983 11 p refs (For primary document see N86-12328 03-28)

Avail: Chemical Propulsion Information Agency, Johns Hopkins Road, Laurel, Md. 20707 HC $61.56 CSCL 21/9

The rare gases are used as pressurizing agents in liquid rocket propulsion. Their physical and chemical properties are listed. A guideline for their safe processing, handling, storage, and transportation is given. Emergency procedures to be taken in the event of accidental spills or leaks are also given. F.M.R.

N86-12349# IIT Research Inst., Chicago, Ill.
THE ALCOHOLS
In its Hazards of Chem. Rockets and Propellants, Vol. 3 Sep. 1984 15 p refs (For primary document see N86-12328 03-28)
Avail: Chemical Propulsion Information Agency, Johns Hopkins Road, Laurel, Md. 20707 HC $61.56 CSCL 21/9

Alcohols are used in liquid rocket propulsion. Their physical and chemical properties are listed. A guideline for their safe processing, handling, storage, and transportation is given. Emergency procedures to be taken in the event of accidental spills or leaks are also given. F.M.R.

N86-12350# IIT Research Inst., Chicago, Ill.
HALOCARBONS
In its Hazards of Chem. Rockets and Propellants, Vol. 3 Sep. 1984 31 p refs (For primary document see N86-12328 03-28)
Avail: Chemical Propulsion Information Agency, Johns Hopkins Road, Laurel, Md. 20707 HC $61.56 CSCL 21/9

Halocarbons are used during liquid rocket propulsion. Their physical and chemical properties are listed. A guideline for their safe processing, handling, storage, and transportation is given. Emergency procedures to be taken in the event of accidental spills or leaks are also given. F.M.R.

N86-12351# IIT Research Inst., Chicago, Ill.
HYDRAULIC FLUIDS **c25**
In its Hazards of Chem. Rockets and Propellants, Vol. 3 Sep. 1984 12 p refs (For primary document see N86-12328 03-28)
Avail: Chemical Propulsion Information Agency, Johns Hopkins Road, Laurel, Md. 20707 HC $61.56 CSCL 07/4

Hydraulic fluids are used during liquid rocket propulsion operations. Their physical and chemical properties are listed. A guideline for their safe processing, handling, storage, and transportation is given. Emergency procedures to be taken in the event of accidental spills or leaks are also given. F.M.R.

N86-12352# IIT Research Inst., Chicago, Ill.
MERCURY **c25**
In its Hazards of Chem. Rockets and Propellants, Vol. 3 Sep. 1984 9 p refs (For primary document see N86-12328 03-28)
Avail: Chemical Propulsion Information Agency, Johns Hopkins Road, Laurel, Md. 20707 HC $61.56 CSCL 07/4

Mercury may be used during liquid rocket propulsion operations. Its physical and chemical properties are listed. A guideline for its safe processing, handling, storage, and transportation is given. Emergency procedures to be taken in the event of accidental spills or leaks are also given. F.M.R.

N86-12353# IIT Research Inst., Chicago, Ill.
COMPRESSED AND LIQUID AIR **c25**
In its Hazards of Chem. Rockets and Propellants, Vol. 3 Sep. 1984 8 p refs (For primary document see N86-12328 03-28)
Avail: Chemical Propulsion Information Agency, Johns Hopkins Road, Laurel, Md. 20707 HC $61.56 CSCL 07/4

Compressed and liquid/air may be used during liquid rocket propulsion operations. Their physical and chemical properties are listed. A guideline for their safe processing, handling, storage, and transportation is given. Emergency procedures to be taken in the event of accidental spills or leaks are also given. F.M.R.

N86-12354# IIT Research Inst., Chicago, Ill.
CARBON DIOXIDE **c25**
In its Hazards of Chem. Rockets and Propellants, Vol. 3 Sep. 1984 10 p refs (For primary document see N86-12328 03-28)
Avail: Chemical Propulsion Information Agency, Johns Hopkins Road, Laurel, Md. 20707 HC $61.56 CSCL 07/4

Carbon dioxide may be used during liquid rocket propulsion operations. Its physical and chemical properties are listed. A guideline for its safe processing, handling, storage, and transportation is given. Emergency procedures to be taken in the event of accidental spills or leaks are also given. F.M.R.

N86-12355# IIT Research Inst., Chicago, Ill.
NITROUS OXIDE **c25**
In its Hazards of Chem. Rockets and Propellants, Vol. 3 Sep. 1984 7 p refs (For primary document see N86-12328 03-28)
Avail: Chemical Propulsion Information Agency, Johns Hopkins Road, Laurel, Md. 20707 HC $61.56 CSCL 07/4

Nitrous oxide is used as a liquid rocket propellant component. Its physical and chemical properties are listed. A guideline for its safe processing, handling, storage, and transportation is given. Emergency procedures to be taken in the event of accidental spills or leaks are also given. F.M.R.

N86-12356# IIT Research Inst., Chicago, Ill.
LIQUID PROPELLANT STORAGE COMPATIBILITY
In its Hazards of Chem. Rockets and Propellants, Vol. 3 Sep. 1984 3 p refs (For primary document see N86-12328 03-28)
Avail: Chemical Propulsion Information Agency, Johns Hopkins Road, Laurel, Md. 20707 HC $61.56 CSCL 21/9

Tables are presented formalizing the safe storage of propellant materials. First of all, they are stored according to similarity and compatibility, for which they are assigned alphabetical storage compatibility group designations (A, B, C, and D). A further segregation is then made on the degree of hazard presented by certain materials, the strength of oxidation, the possibility of pressure rupture, and the danger of chemical explosion. F.M.R.

N86-12357# IIT Research Inst., Chicago, Ill.
QUANTITY-DISTANCE REQUIREMENTS
In its Hazards of Chem. Rockets and Propellants, Vol. 3 Sep. 1984 15 p refs (For primary document see N86-12328 03-28)
Avail: Chemical Propulsion Information Agency, Johns Hopkins Road, Laurel, Md. 20707 HC $61.56 CSCL 21/9

Quantity-distance standards are developed for the safe storage of liquid propellants. These are presented in table form. It is first assumed that the controlling authority has properly housed the propellant materials, assuring adequate fire protection, drainage control, insulation for cryogenic materials, cooling, etc. These standards are based on the estimated credible damage, without considering the probability of frequency of occurrence. F.M.R.

N86-12358# Army Armament Research and Development Command, Watervliet, N. Y. Large Caliber Weapon Systems Lab.
WEAR OF PROJECTILE ROTATING BANDS Final Technical Report
R. S. Montgomery Mar. 1985 27 p
(AD-A156666; AD-E440283; ARLCB-TR-85008) Avail: NTIS HC A03/MF A01 CSCL 19/1

Rotating or driving bands are relatively soft materials surrounding a projectile. They have a number of functions the chief of which is probably that they produce stabilized rotating of the projectile when they are engraved or keyed into the rifling. These bands are used on spin-stabilized projectiles as small as 20 mm caliber, but this discussion concerns especially the larger cannon, i.e., in excess of 105 mm. Excess wear of projectile rotating bands has a number of important negative consequences including inaccuracy and short rounds. There are two distinctly different mechanisms of wear. At low speeds near the beginning of motion, wear is by adhesion, abrasion, and even under some conditions, scuffing. After a few centimeters of sliding, a thin surface film of molten band material is formed and the remainder of the sliding is melt-lubricated. While metal-on-metal sliding is limited to the first few centimeters, it is very important and can result in serious wear problems down bore. The exact wear of rotating bands depends on the motion of the projectile in the bore of the cannon. Therefore, this motion can be inferred from the wear. GRA

N86-12359# Southwest Research Inst., San Antonio, Tex. Fuels and Lubricants Research Lab.
MICROEMULSION-TYPE FIRE-RESISTANT DIESEL FUEL Interim Report, 1 Jan. 1982 - 31 Dec. 1984
W. D. Weatherford, Jr., G. E. Fodor, B. R. Wright, M. D. Kanakia, and E. C. Owens 31 Dec. 1984 100 p
(Contracts DAAK20-82-C-0001; DAAK70-85-C-0001)
(AD-A157125; AFLRL-191) Avail: NTIS HC A05/MF A01 CSCL 21/4

An approach to developing a fire-resistant diesel fuel (FRF) has been identified as being potentially feasible for protecting diesel-powered armored combat vehicles. This approach involves the addition of 10 vol% water and 12 vol% emulsifier premix (equal parts surfactant and aromatic concentrate) to diesel fuel to form a stable water-in-fuel microemulsion. Water, containing less than 50 ppm of dissolved solids, is required if stable formulations are to be made with all diesel fuels which may be encountered. For the same reason, it has been found necessary to include in the formulation an additional 6 vol% of an aromatic hydrocarbon concentrate to serve as a combination microemulsion promoter and emulsifier solvent/thinner. The most significant FRF inadequacy is the filter plugging at subfreezing temperatures. This, in turn, precludes FRF use under all weather conditions. In addition to the foregoing applied research, a parallel program of basic research conducted in which the influences of changes in emulsifier chemistry on diesel microemulsion phase stability, low-temperature properties, and water purity requirements were studied, and an extensive literature survey was carried out. Overall, none of the modified systems studied produced emulsions that were unambiguously superior to those made by the standard FRF surfactant.
GRA

N86-12360# SRI International Corp., Menlo Park, Calif. Chemistry Lab.
OXIDATION AND GUM FORMATION IN DIESEL FUELS Interim Report, 10 Sep. 1984 - 30 Apr. 1985
F. R. Mayo 3 May 1985 17 p
(Contract DAAG29-84-K-0161)
(AD-A157410; ARO-21165.2-EG; IR-2) Avail: NTIS HC A02/MF A01 CSCL 21/4

Rates of oxygen absorption (R sub O) and gum formation (R sub g) are now related by the R sub g/ R sub o ratio, the reciprocal of the ratio previously used. The change was made because when the oxygen content of the gum is known, the R sub g/ R sub o ratio is proportional to the fraction of oxygen absorbed that appears in the gum. Oxidations of tetralin (TET) and 2-ethyl-naphthalene (EtN) at 130 C are initially fast but the rates decrease regularly. The oxidation of n-dodecane (DOD) is clearly autocatalytic; it requires the most oxygen to produce a milligram of gum while EtN, among the pure hydrocarbons, requires the least. Rates of oxygen absorption for DOD at 100 C appear to be erratic. Part of the problem is autocatalysis; part is near exhaustion of oxygen. The best results are those for K92A and K92C. R sub o without t-Bu2O2 is autocatalytic. Trends in oxidations of Fuels 14 and 14A, which are different at 130 C, are not yet clear at 100 deg., and 60 C. The important points in the above discussion are: The oxidation of DOD is autocatalytic; oxidations of TET, EtN, and Fuel 14 are self-retarding. In our oxidations of Fuel 14 with shaking, all the deposits at 100 deg. and 130 C appear as films on glass; no deposits have yet been obtained at lower temperatures. The ratio R sub g/ R sub o, still appears to be essentially constant for any fuel at a single temperature, even with large differences in R sub o from addition of t-Bu2O2. Thus, gum can be accumulated relatively rapidly for experimental purposes. We are accumulating new data at 43 deg. and 60 deg. C. These findings should assist materially in our efforts to understand and devise a test for fuel stability.
GRA

N86-12361# Naval Weapons Center, China Lake, Calif.
EFFECTS OF SURFACE INTERACTIONS AND MECHANICAL PROPERTIES OF PLASTIC BONDED EXPLOSIVES ON EXPLOSIVE SENSITIVITY. PART 2: MODEL FORMULATION Annual Report, 1 Oct. 1983 - 30 Sep. 1984
R. Y. Yee and E. C. Martin Mar. 1985 31 p
(AD-A157900; AD-E900452; NWC-TP-6619-Pt-2) Avail: NTIS HC A03/MF A01 CSCL 19/1

Eight major mixes are prepared from three baseline binders. The tensile and torsional shear mechanical properties and burning behavior of these model mixes are investigated. The binder-filler bond energy determined from the surface studies can be correlated to the energy required for the onset of dewetting. The specific impulses of the model mixes are calculated. Some of the model mixes containing energetic binder are difficult to ignite at low energy flux. This suggests that the formulations may be candidates for insensitive energetic systems.
GRA

N86-12362# Georgia Inst. of Tech., Atlanta. School of Aerospace Engineering.
INVESTIGATION OF THE FLAME-ACOUSTIC WAVE INTERACTION DURING AXIAL SOLID ROCKET INSTABILITIES Interim Scientific Report
B. T. Zinn and B. R. Daniel Apr. 1985 19 p
(Grant AF-AFOSR -84-0082)
(AD-A158559; AFOSR-85-0561TR) Avail: NTIS HC A02/MF A01 CSCL 21/2

The primary objective of this study is the determination of the fundamental mechanisms responsible for the driving of axial instabilities by solid propellant flames. During the report period, the behavior of a premixed flame stabilized on the side wall of a duct in the presence of an axial acoustic field was investigated both theoretically and experimentally. The developed model solutions show that driving occurs due to the combustion process heat addition while outside the reaction zone the waves are damped by viscous processes. This damping increases as the thickness of the acoustic boundary layer increases. Experimental facilities for studying oscillating duct flow in the presence and absence of flames were developed. Cold flow studies verified the presence of an excess velocity region within the acoustic boundary layer (i.e., the Richardson Effect) and the dependence of the boundary layer thickness upon the frequency and wall injection velocity. Reactive flow studies showed that the behavior of the flame depends upon its location relative to the standing acoustic wave. When the flame was positioned next to a velocity antinode, unexpected instabilities appeared on its surface eventually resulting in severe flame distortion. Also, the measured C-C and C-H radiation signals were periodic and they oscillated with the same frequency as the acoustic wave.
GRA

N86-12363# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Mechanical Engineering.
MULTIPLE IGNITION, COMBUSTION AND QUENCHING OF HYDROCARBON FUEL SPRAYS Annual Report, Jul. 1983 - Jul. 1984
S. Aggarwal, R. Bishop, W. A. Sirignano, and H. T. Sommer Aug. 1984 14 p
(Grant AF-AFOSR-0203-80)
(AD-A158560; AFOSR-85-0498TR) Avail: NTIS HC A02/MF A01 CSCL 21/4

A detailed parametric study of the ignition of a monodisperse fuel-air spray in contact with a hot wall was conducted. The theoretical model was one-dimensional unsteady and employed a hybrid Eulerian-Lagrangian numerical scheme. Effects of drop size, chemical kinetics, fuel-air ratios, fuel type and other parameters were examined. The results indicated the statistical character of the spray ignition, the existence of optimum droplet size and optimum fuel-air ratio for the minimum ignition delays. The study was extended to the polydisperse spray. The major conclusion was that the polydisperse results can be correlated with an equivalent monodisperse spray represented by a mean diameter based on the total spray surface area. The study of ignition for sprays flowing over a hot plate was initiated. The formulation and the numerical coding were completed. Currently the code is being employed to predict the ignition delays for the flowing sprays. Preliminary experiments were conducted to investigate the ignition of a single droplet stream along a heated surface. The results show an optimal distance from the surface for the droplet stream.

It is speculated that this distance depends on the characteristic evaporation time, diffusion time and convective time inherent to the system. Experiments separating the effects are underway to investigate this interactive process. Author (GRA)

N86-12364# Midwest Research Inst., Golden, Colo.
AQUATIC SPECIES PROGRAM REVIEW: PROCEEDINGS OF PRINCIPAL INVESTIGATORS MEETING
Jun. 1985 353 p Presented at the SERI Aquatic Species Rev. - Principle Investigators Meeting, Golden, Colo., 20 Mar. 1985
(Contract DE-AC02-83CH-10093)
(DE85-012137; SERI/CP-231-2700; CONF-8503158) Avail: NTIS HC A16/MF A01

The purpose of the Aquatic Species Program is to improve the productivity, conversion to fuels, and cost efficiency of aquatic plant culture technologies. The emphasis of the program is on developing a mass culture technology for cultivating oil-yielding microalgae in the American southwest. A technical and economic analysis indicated that such a concept would be feasible if: (1) lipid yields from microalgae are improved, (2) there is sufficient saline water for large-scale development, and (3) microalgal lipids can be economically converted to conventional fuels. It was determined that fuels from microalgal lipids presented better options than converting the microalgal biomass to either alcohols or methane. All lipids can potentially be catalytically converted to gasoline, or the fatty acids can be converted to substitute diesel fuels. The Southwest has the necessary low, flat, underutilized lands, and carbon dioxide is available from either natural deposits or flue gas from industrial plants. The amount of saline water available will probably determine how much fuel can be produced from aquatic species, and this question should be answered during 1985. The largest constraint of this technology is the economical production of an oil-rich microalgal feedstock. DOE

N86-12365# Lawrence Livermore National Lab., Calif.
ENERGETIC RESPONSE OF PROPELLANTS TO HIGH VELOCITY IMPACT, REVISION 1
L. Green, E. James, and E. Lee 11 Jun. 1985 7 p refs Presented at the 8th Intern. Symp. on Detonation, Albuquerque, N. Mex., 15 Jul. 1985
(Contract W-7405-eng-48)
(DE85-013983; UCRL-91486-Rev-1; CONF-850706-22-Rev-1) Avail: NTIS HC A02/MF A01

An impact impulse on a full density intact propellant or explosive must be of high intensity (several gigapascals) to initiate detonation. Accident situation impact impulses are typically an order of magnitude less intense. The fact that detonation can arise from such lower level impulses is almost always the result of secondary compression of damaged (i.e., lower density) material. A spectrum of possible conditions has been investigated in order to evaluate threshold impact values which will cause detonation in damaged propellants. The results of new experiments involving in situ damage and impact of two propellants are reported. DOE

N86-12366# Los Alamos Scientific Lab., N. Mex.
TATE: STRONG BASIC REACTIONS PROVIDE SOLUBLE DERIVATIONS FOR SIMPLE QUALITITATIVE HIGH EXPLOSIVE SPOT TEST
B. W. Harris May 1985 15 p refs
(Contract W-7405-eng-36)
(DE85-014259; LA-10420-MS) Avail: NTIS HC A02/MF A01

Reactions of TATB in aqueous, strongly basic solutions gave metal salts of 1,3,5-trihydroxy-2,4,6-trinitrobenzene (THTNB) also called trinitrophloroglucinol. Thus, we prepared potassium, sodium, and barium salts. The mono and diammonium salts were prepared by treating THTNB with ammonia and ammonium hydroxide, respectively. Some explosive properties of the salts were evaluated. From the physical characteristics of the salts in various solvents, a spot test was developed for known high explosives (HE) containing TATB. DOE

N86-12367# Chicago Univ., Ill.
LIMITS OF THERMOCHEMICAL AND PHOTOCHEMICAL SYNTHESES OF GASEOUS FUELS: A FINITE-TIME THERMODYNAMIC ANALYSIS Annual Report, Sep. 1983 - Feb. 1985
R. S. Berry Mar. 1985 174 p refs
Avail: NTIS HC A08/MF A01 CSCL 21D

The objectives of this project are to develop methods for the evaluation of syntheses of gaseous fuels in terms of their optimum possible performance, particularly when they are required to supply those fuels at nonzero rates. The first objective is entirely in the tradition of classical thermodynamics, the processes, given the characteristics and constraints that define them. The new element which this project introduces is the capability to set limits more realistic than those from classical thermodynamics, by the inclusion of the influence of the rate or duration of a process on its performance. A second objective is to determine how any given process should be carried out, within its constraints, in order to yield its optimum performance and to use this information whenever possible to help guide the design of that process. GRA

N86-12368# Joint Publications Research Service, Arlington, Va.
CHINA REPORT: SCIENCE AND TECHNOLOGY
25 Jul. 1985 103 p refs Transl. into ENGLISH from various Chinese articles
(JPRS-CST-85-024) Avail: NTIS HC A06/MF A01

China Report: Science and Technology (25 July 1985) contains articles from scientific literature of the Peoples' Republic on National Development, Applied Sciences, Life Sciences, Scientists and Scientific Organizations, Acoustics, Chemical Industry, Computers, Control Systems, Electronics, Lasers, Mechanics, Metallurgy, Oceanography, Physical Chemistry, Physics, and Preventive Medicine. Of particular interest in this issue are two articles on solid rocket propellants under Applied Sciences. For individual titles, see N86-12369 through N86-12370.

N86-12369# Joint Publications Research Service, Arlington, Va.
PRESSURE-COUPLED RESPONSE FUNCTION OF SOLID PROPELLANTS INCLUDING THOSE WITH NEGATIVE PRESSURE EXPONENTS
Xu Wengan *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-024) 25 Jul. 1985 p 4-17 refs Transl. into ENGLISH from Yuhang Xuebao (Beijing), no. 1, Jan. 1985 p 47-58 Previously announced in IAA as A85-42780 (For primary document see N86-12368 03-28)
Avail: NTIS HC A06/MF A01

A new pressure coupled response function of solid propellants has been theoretically derived using a combustion response model based on the steady state burning of composite solid propellants, including those with negative pressure exponents. In this model, the burning surface of a given propellant is divided into one part consisting of a region of the AP surface covered by molten binder with a corresponding binder surface and another part consisting of a region of the AP surface uncovered by molten binder with the remaining binder surface. The covered part of the surface is analyzed taking the condensed phase reaction and the gasification of covered AP into consideration. The results calculated by the derived pressure coupled response function for S04-5A propellant are in reasonable agreement with experimentally observed behavior. Author

N86-12370# Joint Publications Research Service, Arlington, Va.
ONE-DIMENSIONAL TWO-PHASE FLOW IN COMBUSTION CHAMBER OF SOLID PROPELLANT ROCKET MOTORS
Chang Xianqi *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-024) 25 Jul. 1985 p 18-33 Transl. into ENGLISH from Yuhang Xuebao (Beijing), no. 1, Jan. 1985 p 11-23 Previously announced in IAA as A85-42777 (For primary document see N86-12368 03-28)
Avail: NTIS HC A06/MF A01

In this paper, a numerical solution of basic equations for one dimensional two phase nonequilibrium flow in combustion chambers of solid propellant rocket motors is discussed in detail. The effect of particle size on the flow field in a chamber and pressure time curves is analyzed, and some useful conclusions are obtained in comparison with results of one dimensional two phase constant

lag flow in a chamber. It is useful for predicting pressure time curves accurately and providing accurate boundary conditions for the calculation of two phase flow through a nozzle. Author

N86-12418# Joint Publications Research Service, Arlington, Va.
CHARACTERISTIC VALUE AS AN ENERGY OUTPUT INDEX FOR EXPLOSIVES
Zhang Housheng and Zhang Shanshan *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-018) 12 Jun. 1985 p 89-98 refs Transl. into ENGLISH from Binggong Xuebao (Beijing), no. 1, Feb. 1984 p 36-42 (For primary document see N86-12413 03-31)
Avail: NTIS HC A09/MF A01

N86-12423# Joint Publications Research Service, Arlington, Va.
QUANTUM CHEMISTRY OF AROMATIC NITRO EXPLOSIVES
Xiao Heming, Wang Zunyao, and Yao Jianmin *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-021) 8 Jul. 1985 p 85-90 refs Transl. into ENGLISH from Huaxue Xuebao (Shanghai), v. 43, no. 1, Jan. 1985 p 14-18 (For primary document see N86-12421 03-31)
Avail: NTIS HC A09/MF A01

N86-12461# Joint Publications Research Service, Arlington, Va.
APPLICATION OF HEAT-SCAN NDT TO INSPECTION OF ADHESION OF SOLID ROCKET MOTOR PROPELLANT TO ENVELOPE
Tian Enrui *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-026) 15 Aug. 1985 p 77-80 Transl. into ENGLISH from Harbin Gongye Daxue (Harbin), no. 1, Mar. 1985 p 74-83 (For primary document see N86-12459 03-31)
Avail: NTIS HC A07/MF A01

31 ENGINEERING (GENERAL)

Includes vacuum technology; control engineering; display engineering; and cryogenics.

N86-12371 Ohio State Univ., Columbus.
OPTIMIZATION OF THE LOCOMOTION OF A LEGGED VEHICLE WITH RESPECT TO MANEUVERABILITY Ph.D. Thesis
Dominic Anthony Messuri 1985 299 p
Avail: Univ. Microfilms Order No. DA8510604

A legged vehicle possesses a tremendous potential for maneuverability over rough terrain, particularly in comparison to conventional wheeled or tracked vehicles. In general, a legged vehicle can offer more degrees of freedom for movement than conventional vehicles. However, the coordination of the movements of the various leg joints in such a way as to produce the desired locomotion of the vehicle is an extremely complex task. The work documented in this dissertation is aimed at improving the maneuverability of a legged vehicle and reducing the operator's burden of manipulating the body and limbs. A major contribution of this research has been the development of the Dual Tripod Leg Placement Algorithm. This represents the first hardware implementation of supervisory control for an omnidirectional walking algorithm capable of rough terrain locomotion. In this algorithm, leg motion is limited only by geometrical considerations; there are no time sequencing constraints as in the typical wave gait formulations. The result is an extremely agile walking algorithm. Dissert. Abstr.

N86-12372# Tokyo Denki Univ. (Japan). Faculty of Engineering.
RESEARCH REPORTS OF THE FACULTY OF ENGINEERING, TOKYO DENKI UNIVERSITY, NO. 32
Dec. 1984 189 p refs In JAPANESE; ENGLISH summaries
(ISSN-0389-617-X) Avail: NTIS HC A09/MF A01

Various research project results in the field of physics are reported by the engineering department of the Tokyo Denki University. Topics considered include: (1) plasma diagnostics in a shock tube; (2) building response in earthquake simulated by a mathematical model; (3) computer aided stress analysis; (4) speech recognition; (5) effect of cations in nerve excitation; (6) acoustics; (7) electroplating; (8) hydrogen bonds; and (9) plastic shearing. For individual titles, see N86-12373 through N86-12382.

N86-12373# Fuji Electric Co. Ltd., Yokosuka (Japan).
DISSOCIATIVE VOLUME RECOMBINATION COEFFICIENT MEASUREMENTS IN A SUBROOM TEMPERATURE NEON PLASMA AFTERGLOW c35
K. Keskinen, Y. Ichikawa, R. M. Hobson (York Univ., Toronto), H. Fukuda (Sony Co. Ltd., Tokyo), S. Teii (Musashi Inst. of Tech., Tokyo), T. Kaneda (Tokyo Denki Univ.), and J. S. Chang (McMaster Univ.) *In* Tokyo Denki Univ. Res. Rept. of the Faculty of Eng., Tokyo Denki Univ., No. 32 Dec. 1984 p 1-11 refs Sponsored in part by the Natural Sciences and Engineering Research Council of Canada (For primary document see N86-12372 03-31)
Avail: NTIS HC A09/MF A01

A new apparatus for measuring reaction rate coefficients in gaseous plasmas at low temperature is presented. The apparatus consists of a shock tube in which the plasma is generated and the plasma diagnostics are made in the expansion region of the tube. The plasma is generated by means of a R.F. pulse. Diagnostics are primarily made by double and triple electrostatic probes. Preliminary results for the gas temperature dependence of the dissociative volume recombination coefficient of neon in a temperature range of 135K to 250K are discussed. The results indicate that the gas temperature dependence is greater than T sub g to the -1/2 in this temperature range. Author

N86-12374# Tokyo Denki Univ. (Japan). Faculty of Engineering.
EARTHQUAKE-RESPONSE SIMULATION ON HORIZONTALLY LARGE-SCALE BUILDINGS BASED ON THE METHOD OF REDUCTION CONCERNING THEIR RESTORING SPRING MATRIX. DERIVATION OF GENERAL FORM OF SPRING MATRIX AND COMPARISON OF APPLIED RESPONSE RESULTS ON AN ACTUAL BUILDING WITH MEASURED VALUES c39
Fukuzo Suto and Shyuichi Asayama *In its* Res. Rept. of the Faculty of Eng., Tokyo Denki Univ., No. 32 Dec. 1984 p 13-35 refs In JAPANESE; ENGLISH summary (For primary document see N86-12372 03-31)
Avail: NTIS HC A09/MF A01

A horizontally long building structure constituted by many frames towards spanning direction is divided into several substructural blocks of 3-D framework, their required representative forms of reduced stiffness matrices are evaluated through the method of inverting their flexibility matrices firstly calculated and the final form of stiffness matrix on the whole structure is completed through their mutual connections with horizontal slab spring systems. For the general conditions managed with the individual 3-D substructured block they have included the freedoms u, v, and theta together with rocking and swaying covering elastic and plastic regions. The treatment of comparison of the quake-responding behaviors of an actual building with the analytical ones by the above theoretical system, which if accurate physical data of materials of the real structural system are input, gives a considerably good agreement verifying the appropriateness of the method described here. G.L.C.

N86-12375# Tokyo Denki Univ. (Japan). Faculty of Engineering.
A COMPUTER ANALYSIS OF THE DISTRIBUTION OF PRINCIPAL STRESSES USING PHOTOELASTIC PATTERN c39
Shoichi Ohi, Makoto Kotani, Masataka Nisida, Seiji Nakajima, and Setsuzo Honda *In its* Res. Rept. of the Faculty of Eng., Tokyo Denki Univ., No. 32 Dec. 1984 p 37-49 refs In JAPANESE; ENGLISH summary (For primary document see N86-12372 03-31)
Avail: NTIS HC A09/MF A01

A computer system of principal stress-analysis and automatic tracing of stress trajectories employing a personal-computer is described. The boundary condition and interior distribution of principal stress-difference, both obtained from two-dimensional photoelastic pattern, are put in the computer using a digitizer and Laplace's equation with respect to sum of principal stresses is solved numerically by the iteration procedure at 20x20 points over

the model area. The stress trajectories are automatically traced from the obtained sigma sub 1 and sigma sub 2 without recourse to isoclinics which tend to be blurred and troublesome to determine accurately. Author

N86-12376# Tokyo Denki Univ. (Japan). Faculty of Engineering.

EXTRACTION OF FEATURE PARAMETERS FOR SPOKEN WORD RECOGNITION **c32**

T. Tanaka and S. Nakamura *In its* Res. Rept. of the Faculty of Eng., Tokyo Denki Univ., No. 32 Dec. 1984 p 57-65 refs In JAPANESE; ENGLISH summary (For primary document see N86-12372 03-31)

Avail: NTIS HC A09/MF A01

Extraction of local peaks in spectra of voiced signals for a speech recognition system is discussed. Since there are differences of slopes of speech spectra between members, an adaptive correction for the slope is required. A simple method of compensating a slope using a linear phase digital filter is given and it is compared with the correcting method by a least mean square fitting. Author

N86-12377# Tokyo Denki Univ. (Japan). Faculty of Engineering.

EFFECTS OF CATION IONS IN NERVE EXCITATION **c52**

Kazuyuki Aihara, Makoto Kotani, and Toshio Utsunomiya *In its* Res. Rept. of the Faculty of Eng., Tokyo Denki Univ., No. 32 Dec. 1984 p 67-78 refs In JAPANESE; ENGLISH summary (For primary document see N86-12372 03-31)

Avail: NTIS HC A09/MF A01

A bifurcation process of the self-sustained oscillation state of action potentials as a dissipative structure in squid giant axons is theoretically analyzed in relation to a nonequilibrium property inherent to biological membranes. A bifurcation diagram is numerically calculated by the use of the modified Hodgkin-Huxley equations which are derived by considering both an adaptation effect of axons and an effect of divalent cations upon membrane conductance. Further, the result is confirmed by the Hopf bifurcation theory. These analyses clarify the relations between the Hopf bifurcation of the dissipative structure with the limit cycle in squid giant axons and the nonequilibrium property of the ionic concentration differences across the membrane. Author

N86-12378# Tokyo Denki Univ. (Japan). Faculty of Engineering.

A PHYSICAL METHOD FOR ESTIMATING SPEECH INTELLIGIBILITY IN A REVERBERANT SOUND FIELD **c32**

Yasuo Ogura *In its* Res. Rept. of the Faculty of Eng., Tokyo Denki Univ., No. 32 Dec. 1984 p 79-100 refs In JAPANESE; ENGLISH summary (For primary document see N86-12372 03-31)

Avail: NTIS HC A09/MF A01

The MTF-STI method which is a physical method for measuring the quality of speech-transmission in a tunnel was investigated and it appears that the STI, which can be deduced from the MTF, correlates highly with the sound articulation score. The character of the information loss represented by the MTF, and the calculating system of the MTF are considered. In this system the effect of the reverberation on the MTF is calculated from the impulse response in a tunnel, and the effect of the noise separate from the effect of the reverberation is considered. The MTF is converted to the STI (Speech Transmission Index), which corresponds directly to the speech intelligibility. Essentially the STI represents an extension of the Articulation Index (AI) concept, therefore we determine the values of the parameters used in the STI calculation from the parameters of the AI for Japanese. Resulting STI correlates highly with the -log(1-s), where s is a sound articulation score. The data suggest that the STI may serve as a convenient predictor of speech intelligibility in a tunnel. Author

N86-12379# Tokyo Denki Univ. (Japan). Faculty of Engineering.

DUMMY HEAD MICROPHONE AND ITS APPLICATION TO THE MEASUREMENTS OF ELECTRO-ACOUSTIC EQUIPMENTS **c32**

In its Res. Rept. of the Faculty of Eng., Tokyo Denki Univ., No. 32 Dec. 1984 p 101-115 refs In JAPANESE; ENGLISH summary (For primary document see N86-12372 03-31)

Avail: NTIS HC A09/MF A01

An acoustic measurement system using a dummy head microphone was developed. The system consists of a dummy head microphone and an equipment for digital signal processing, and the system can be used to measure characteristics of hearing aids and headphones. The ear simulator, newly developed for practical use, is terminated in a simple resistance element of 320 cgs acoustic ohms. The dummy head microphone with the ear simulator shows the good agreement with the acoustical characteristics of the averaged human external ear. Several measured results of hearing aids and headphones using the measurement system are shown. Author

N86-12380# Tokyo Denki Univ. (Japan). Faculty of Engineering.

STUDY ON ELECTROPAINTING USING ALKOXYMETHYLMELAMINE AS CROSSLINKING AGENT **c27**

R. Shiba, M. Takahashi, H. Yoneyama, and M. Tajima *In its* Res. Rept. of the Faculty of Eng., Tokyo Denki Univ., No. 32 Dec. 1984 p 117-130 refs In JAPANESE; ENGLISH summary (For primary document see N86-12372 03-31)

Avail: NTIS HC A09/MF A01

When alkoxymethylmelamine, which has unsubstituted amino hydrogens, was used as crosslinking agent with substrate resin, the stability of electropainting solution was poor. Namely polymer was formed by self-condensing polymerization of the crosslinking agent, then the resulting polymer worked as nucleus to from big colloid, and the colloid produced bad effects on the adhesiveness and the surface properties of electrodeposition film. Consequently, only hexa-alkoxymethylmelamine which do not polymerize was been able to use as crosslinking agent. Author

N86-12381# Tokyo Denki Univ. (Japan). Faculty of Engineering.

THE STUDIES ON THE EFFECTS OF INTERMOLECULAR HYDROGEN BOND IN MELAMINE RESINATION PROCESS. (METHYLATED MELAMINES WERE ADOPTED AS THE MODEL COMPOUNDS OF STARTING MATERIAL) **c25**

Moritaka Tajima *In its* Res. Rept. of the Faculty of Eng., Tokyo Denki Univ., No. 32 Dec. 1984 p 131-156 refs In JAPANESE; ENGLISH summary (For primary document see N86-12372 03-31)

Avail: NTIS HC A09/MF A01

The effect of intermolecular hydrogen bond formation contributing to the properties of methylolmelamines and the resin was already studied theoretically in our research group by means of CNDO method. However, it has been known that the thermohardening process of methylolmelamines is complicated. Therefore it is needed to prove the process experimentally. Concreately, active amino-hydrogen atoms of melamine was changed into methyl groups to restrict the hydrogen bond formation. Nine methylated melamines and eight methylolized methylated melamines were synthesized, and identified by NMR and IR spectroscopies. The solubility and the melting point of those compounds were measured. From these results it was clarified that the extent of hydrogen bond formation played an important role in the solubility and the melting point. G.L.C.

N86-12382# Tokyo Denki Univ. (Japan). Faculty of Engineering.

STUDY OF HIGH SPEED SHEARING OF THERMOPLASTIC POLYMER SHEETS WITH A NEW ROTARY SHEARING MACHINE **c37**

Isami Aoki and Teizo Maeda *In its* Res. Rept. of the Faculty of Eng., Tokyo Denki Univ., No. 32 Dec. 1984 p 157-168 refs (For primary document see N86-12372 03-31)

Avail: NTIS HC A09/MF A01

An investigation on clarifying the shearing characteristics of thermoplastic polymer sheets is presented. Shearing experiments

were carried out by using a rotating shearing machine newly designed for achieving tests in a wide range of shearing speed. Shearing speed and temperature were widely varied in order to disclose those effects and to find out the optimum shearing conditions. As the result of tests on five kinds of thermoplastic sheets, it is confirmed that the smooth surface can be obtained by selecting the shearing speed and temperature. It is also known that the deformation zone decreases with increasing speed. In addition, this rotary shearing machine is made firm to be available for shearing tests in a wide range of shearing speed. Author

N86-12383# Tohoku Univ., Sendai (Japan). Research Inst. of Electrical Communication.
THE RECORD OF ELECTRICAL AND COMMUNICATION ENGINEERING CONVERSAZIONE, VOLUME 54, NO. 1
Aug. 1985 34 p refs In JAPANESE; ENGLISH summaries
(ISSN-0385-771-9) Avail: NTIS HC A03/MF A01

Progress in the fields of electrical engineering and computer science by Tohoku University are reported. Topics of interest are: (1) the development of a new high efficiency peniotron; (2) the analysis of hysteresis in a diode loaded loop antenna electromagnetic field sensor; (3) a resonant frequency method of nondestructive testing; (4) the use of high level programming language to check logic design in very large scale integrated circuits; and (5) computer programming with high level programming languages such as PROLOG. For individual titles, see N86-12384 through N86-12388.

N86-12384# Tohoku Univ., Sendai (Japan). Research Inst. of Electrical Communication.
PROPOSAL OF A HIGH EFFICIENT AND HIGH POWER PENIOTRON **c35**
Nobuyuki Sato, Mohamad Razeghi, Takehisa Suzuki, Kuniyoshi Yokoo, and Shoichi Ono *In its* The Record of Elec. and Commun. Eng. Conversazione, Vol. 54, No. 1 Aug. 1985 p 1-8 refs In JAPANESE; ENGLISH summary (For primary document see N86-12383 03-31)
Avail: NTIS HC A03/MF A01

A modified peniotron which is expected to increase both of handling power and conversion efficiency compared with the original peniotron, and the analytical results of its operational characteristics using some computer simulations are discussed. The analytical results assuming the fundamental operation of omega sub o = approx. omega sub c at 10GHz show that an extremely high transverse efficiency of nearly 100% would be attainable over a considerably wide range of out-put power. And also, this tube is capable to increase the handling power because of the use of a TE sub 11 rectangular waveguide cavity instead of the double-pair ridge waveguide cavity used for the original peniotron. Author

N86-12385# Tohoku Univ., Sendai (Japan). Research Inst. of Electrical Communication.
HYSTERESIS CHARACTERISTICS OF A DIODE LOADED E-M LOOP SENSOR **c33**
Hiroshi Echigo *In its* The Record of Elec. and Commun. Eng. Conversazione, Vol. 54, No. 1 Aug. 1985 p 9-13 refs In JAPANESE; ENGLISH summary (For primary document see N86-12383 03-31)
Avail: NTIS HC A03/MF A01

Proper sensors are required to probe the Electro-Magnetic Environment. As one of the sensors, a diode loaded loop antenna was tested. Unexpectedly, it showed hysteresis characteristics in the frequency responses. The hysteresis comes from the voltage depending capacity of the diode using the equivalent circuit. Author

N86-12386# Tohoku Univ., Sendai (Japan). Research Inst. of Electrical Communication.
ACCURACY OF A NEW ULTRASONIC APPARATUS FOR SIMPLE MEASUREMENT OF VISCOELASTICITY **c71**
Ryohji Aoyagi and Hiroshi Shimizu *In its* The Record of Elec. and Commun. Eng. Conversazione, Vol. 54, No. 1 Aug. 1985 p 14-19 refs In JAPANESE; ENGLISH summary (For primary document see N86-12383 03-31)
Avail: NTIS HC A03/MF A01

A new simple nondestructive method of measuring the complex elastic modulus by detecting the changes in the resonance frequency and the mechanical quality factor of the ultrasonic vibrator when its horn tip is pressed upon a testing material with a static force is discussed. Elastic moduli of polymers (acryl, polyacetal, polycarbonate) measured by the present method are compared with those measured by the composite resonator method. It is demonstrated that the accuracy of the measured values of the Young's modulus, E, is fairly good for the three materials in the temperature range from -10 C to 60 C and that of the elastic loss factor, tan DELTA is satisfactorily good for acryl, while not so good for polyacetal and polycarbonate. Author

N86-12387# Tohoku Univ., Sendai (Japan). Research Inst. of Electrical Communication.
THE VERIFICATION OF THE LOGIC CIRCUITS BASED ON PARTICLIZED INFORMATION BITS WITH PROLOG **c33**
Yoshiaki Takai, Fusao Nakagawa, Tadao Nakamura, and Yoshiharu Shigei *In its* The Record of Elec. and Commun. Eng. Conversazione, Vol. 54, No. 1 Aug. 1985 p 20-25 refs In JAPANESE; ENGLISH summary (For primary document see N86-12383 03-31)
Avail: NTIS HC A03/MF A01

The more logic elements are being integrated into single LSI chip, the more significant the accuracy of logic design is becoming. In order to fabricate VLSI chips costly, a reliable and effective verification system will become necessary. A formal model based on particlized information bits is presented. The logic elements of this model are represented by three kinds of functional nodes and the logic operation of those can be specified with temporal logic. Secondly, the formal verification methodology of the logic circuit constructed of the functional nodes using Prolog which is considered one of the most popular logic programming languages is discussed. Lastly, CPU time for the verification of fundamental product logic circuits, and also the possibilities of its reduction using meta-logical function are assessed. Prolog could be very convenient for the formal verification of logic circuits. Author

N86-12388# Tohoku Univ., Sendai (Japan). Research Inst. of Electrical Communication.
A METHODOLOGY FOR SYNTAX-ANALYSIS USING PROLOG **c61**
Takahika Murayama, Yoshiyuki Kawazoe, and Yoshiharu Shigei *In its* The Record of Elec. and Commun. Eng. Conversazione, Vol. 54, No. 1 Aug. 1985 p 26-30 refs In JAPANESE; ENGLISH summary (For primary document see N86-12383 03-31)
Avail: NTIS HC A03/MF A01

The information represented by the high level programming languages has been expressed for executing tasks by the computer. The series of basic construction elements called Words is admitted as pure statements that belong to a specific programming language only in the case that they follow the same rules (syntax). The metalanguage written by BNF (Backus-Naur-Form) is prepared, so as to describe the rules for construction of a sentence. BNF prescribes how the language is constructed through gathering of characters and symbols. Using prolog a methodology is presented which analyzes the rules for the construction of a metalanguage sentence written by BNF and; recognizes whether a series of symbols follow these rules or not. Author

N86-12389# Forest Products Lab., Madison, Wis.
STEAM-INJECTION PRESSING OF ISOCYANATE-BONDED ASPEN FLAKEBOARDS, LATITUDES AND LIMITATIONS
R. L. Geimer Jul. 1985 19 p
(AD-A157833; FPL-456) Avail: NTIS HC A02/MF A01 CSCL 13/8

Injection of steam into a flakeboard mat during pressing significantly reduces press times. One-half-inch-thick 0.640 specific gravity (SG) isocyanate-bonded aspen flakeboard can be cured in 60 seconds by injecting 99 Btu's of steam energy per pound (Btu/lb) of board. Press time may be reduced to 40 seconds

when energy consumption is increased to 177 Btu/lb of board. Two-inch-thick 0.640 SG board can be pressed in 201 seconds with 185 Btu/lb. Blister formation in high-density thin boards and temperature variation in low-density thick boards were compensated for with press cycles individually suited for each combination of board thickness and SG. GRA

N86-12390# Rockwell International Corp., Golden, Colo.
OPTIONS FOR OPERATIONAL RISK ASSESSMENTS
S. A. Dover 1985 12 p Presented at the 7th Intern. System Safety Conf., San Jose, Calif., 25 Jul. 1985
(Contract DE-AC04-76DP-03533)
(DE85-014904; RFP-3855; CONF-850723-4) Avail: NTIS HC A02/MF A01

Risk assessment is a set of analytical tools that can be used to clarify possible outcomes of decisions where the two different courses of action are indicated or different values are in conflict. These conflicts often arise in the management of any production or support facility. This paper outlines the options for performing risk assessments of any scope and the parameters that determine their effectiveness. It highlights the relative costs of each option, useful information developed, and limitations of the information. The paper concludes with the types of decisions that are routinely made in an operating facility and could benefit from the information generated in a risk assessment. DOE

N86-12391# Sandia National Labs., Albuquerque, N. Mex.
NUMERICAL STUDIES OF THE DYNAMIC ISENTROPIC LOADING OF SOLID MOLECULAR HYDROGEN
T. G. Trucano, L. M. Barker, J. R. Asay, and G. I. Kerley 1985 6 p Presented at the Am. Phys. Soc. Topical Conf. on Shock Waves in Condensed Matter, Spokane, 22 Jul. 1985
(Contract DE-AC04-76DP-00789)
(DE85-013961; SAND-85-0411C; CONF-850736-18) Avail: NTIS HC A02/MF A01

Barker, et al., have proposed a dynamic technique for isentropically compressing solid molecular hydrogen specimens to multi-Mbar pressures. Because of the many novel features of this experimental technique, computational simulations of the experiment have been used extensively in the experimental design effort. Over the past two years, many such simulations have been performed. Our purpose in the present paper is to briefly summarize important conclusions resulting from this work. We briefly describe the equation of state of solid molecular hydrogen currently in use in our calculations. We are, of course, primarily interested in the uncertainties in the equation of state, and how these influence the calculations. We then discuss the computational approach and summarize some important conclusions of the work. Finally, we consider the relevance of these results to the proposed experiment. DOE

N86-12392# Wyle Labs., Inc., Huntsville, Ala.
SAFETY CRITERIA FOR THE OPERATION OF GASEOUS HYDROGEN PIPELINES Final Report
W. W. Youngblood 12 Nov. 1984 92 p refs
(Contract DTRS56-81-C-00043)
(PB85-206159; WR-84-24; RSPA/DMT10-85/1) Avail: NTIS HC A05/MF A01 CSCL 13B

This report discusses safety criteria for the transportation of gaseous hydrogen by pipeline. Major emphasis is placed on transmission pipelines, but distribution piping is also considered. The report concludes that under certain conditions gaseous hydrogen could pose public safety hazards that are not adequately addressed by current safety code regulations. Preliminary criteria for the design of new gaseous hydrogen transmission lines, for converting existing transmission lines to gaseous hydrogen service, for enhanced operating procedures and maintenance practices for mainline transmission systems, and for introducing hydrogen into existing or new distribution systems are recommended. GRA

N86-12393# Joint Publications Research Service, Arlington, Va.
CHINA REPORT: SCIENCE AND TECHNOLOGY
23 May 1985 152 p refs Transl. into ENGLISH from various Chinese articles
(JPRS-CST-85-016) Avail: NTIS HC A08/MF A01

China Report (23 May 1985) is a periodic collection of Chinese (People's Republic) Science and Technology articles. Subjects encompassed include national developments in the sciences and technology, applied sciences, life sciences, environmental quality, biochemistry, chemistry, computer developments and applications, oceanography, oncology, optics and radiation. Of special interest in this volume are articles on laser technology, satellite sounding, and fluid mechanics. For individual titles, see N86-12394 through N86-12398.

N86-12394# Joint Publications Research Service, Arlington, Va.
COMPACT TEA-CO2 LASER WITH LONG LIFE DEVELOPED **c36**
Yin Yiyan, Zhang Yixiang, Want Zongjin, Wei Xianren, and Gao Chunguang *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-016) 23 May 1985 p 36-42 refs Transl. into ENGLISH from Yingyong Jiguang (Shanghai), v. 5, no. 1, Feb. 1985 p 39-42 (For primary document see N86-12393 03-31)
Avail: NTIS HC A08/MF A01

A compact TEA-CO2 laser for ranging application has been made. The laser is 100x100x300 cu mm in size, the maximum output energy per pulse is 500 mJ and the laser has been operated over 10 to the 6th power pulses at 60 mJ output energy. An experimental and theoretical study is made of the laser plasma charge. Author

N86-12395# Joint Publications Research Service, Arlington, Va.
FREQUENCY SELECTION AND MODE LOCKING OF Nd:YAG LASER **c36**
Tang Guichen and Qiu Peixia *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-016) 23 May 1985 p 43-50 refs Transl. into ENGLISH from Zhongguo Jiguang (Shanghai), v. 12, no. 1, 20 Jan. 1985 p 11-14 (For primary document see N86-12393 03-31)
Avail: NTIS HC A08/MF A01

Using a prism as the dispersion element the mode locking of a Nd:YAG laser at four spectral lines (1.052, 1.061, 1.064, and 1.073 microns) has been achieved. The calculated output wavelength stability agreed with the experimental results. Author

N86-12396# Joint Publications Research Service, Arlington, Va.
MEAN DENSITY SCALE HEIGHTS FROM ANALYSIS OF VARIATION IN PERIGEE HEIGHT OF CHINA'S SECOND SATELLITE **c13**
Feng Zhanliang *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-016) 23 May 1985 p 67-72 refs Transl. into ENGLISH from Kongjian Kexue Xuebao (Beijing), v. 4, no. 1, 1984 p 76-81 Original language document was announced in IAA as A86-45634 (For primary document see N86-12393 03-31)
Avail: NTIS HC A08/MF A01

A method for computing the density scale height H is discussed. Four mean values of the density scale height H are determined from the analysis of variations in the perigee height of China's second satellite. The difference between the determined values and CIRA-1972 is less than 10 percent, the mean H is 5 percent greater than that given by CIRA-1972. Author

N86-12397# Joint Publications Research Service, Arlington, Va.
NUMERICAL COMPUTATION OF FULL THREE-DIMENSIONAL FLOW IN TRANSONIC TURBINES **c34**
Shen Mengyu and Zhang Yaoke *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-016) 23 May 1985 p 73-77 refs Transl. into ENGLISH from Shuzhi Jisuan yu Jisuanji Yingyong (Beijing), no. 2, Jun. 1984 p 125-128 (For primary document see N86-12393 03-31)
Avail: NTIS HC A08/MF A01

The scalar integral form of momentum equations in the cylindrical coordinate system is derived by a simple method. The derived equations can be applied to an arbitrary control volume. It is shown that all radial momentum equations are missing a term. The influence of the missing term on computational results is discussed using a numerical test. It is also shown that the discrete

form of the radial momentum equation has a wrong sign and cannot be applied to an arbitrary control volume. Author

N86-12398# Joint Publications Research Service, Arlington, Va.
CODE OF FINITE ELEMENT ANALYSIS FOR THREE-DIMENSIONAL FLOW IN TURBOMACHINES c34
Huang Aixiang *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-016) 23 May 1985 p 78-91 refs Transl. into ENGLISH from Shuzhi Jisuan yu Jisuanji Yingyong (Beijing), no. 1, Mar. 1984 p 38-47 (For primary document see N86-12393 03-31)
Avail: NTIS HC A08/MF A01

The code of finite element analysis based on the arbitrary stream surface theory of three-dimensional flow in turbomachines is presented. The structure of the code and numerical examples using this code are also provided. Author

N86-12399# Joint Publications Research Service, Arlington, Va.
CHINA REPORT: SCIENCE AND TECHNOLOGY
17 Oct. 1985 154 p refs Transl. into ENGLISH from various Chinese articles
(JPRS-CST-85-035) Avail: NTIS HC A08/MF A01

Advances in science and technology by the Peoples Republic of China are reported. Topics of discussion include; (1) national development; (2) physical sciences; (3) applied sciences; (4) astronautics; (5) chemistry; (6) computers; (7) cryogenics; (8) electronics; (9) engineering; (10) mathematics; (11) physics; (12) semiconductors; and (13) solar energy. For individual titles, see N86-12400 through N86-12407.

N86-12400# Joint Publications Research Service, Arlington, Va.
NEW CRITERION OF COMBINED-MODE BRITTLE FRACTURE DESCRIBED c39
Lin Baisong *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-035) 17 Oct. 1985 p 27-33 refs Transl. into ENGLISH from Yingyong Shuxue He Lixue (Chongqing), v. 5, no. 6, Nov. 1984 p 849-853 (For primary document see N86-12399 03-31)
Avail: NTIS HC A08/MF A01

A new mixed-Mode brittle fracture criterion, the circumferential stress-strain product, is presented. It is found to be in good agreement with experimental data. Author

N86-12401# Joint Publications Research Service, Arlington, Va.
CARTOGRAPHY, NATIONAL LAND MANAGEMENT RELATED c43
Shao Wenxiang *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-035) 17 Oct. 1985 p 34-35 Transl. into ENGLISH from Renmin Ribao (Beijing), 16 May 1984 p 5 (For primary document see N86-12399 03-31)
Avail: NTIS HC A08/MF A01

The practice of surveying and cartography provides one of the indispensable and fundamental preliminary task for national land management. As a matter of fact, the success of national land management is closely related to the performance of the surveying and cartography service. The development of national land management requires a thorough preliminary inventory of geographical conditions and the natural and human resources in the territory; the surveying and cartography process is one of the important means to obtain this type of information. Land management is based on the results and maps produced by the surveying and cartography service. Nearly all the land management tasks, such as land planning and management, utilization, protection and administration, require the information acquired by surveying and cartography. G.L.C.

N86-12402# Joint Publications Research Service, Arlington, Va.
BENEFITS OF SURVEYING, CARTOGRAPHY DESCRIBED c43
Yu Cang *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-035) 17 Oct. 1985 p 36-39 Transl. into ENGLISH from Renmin Ribao (Beijing), 16 May 1984 p 5 (For primary document see N86-12399 03-31)
Avail: NTIS HC A08/MF A01

Surveying and cartography are two important methods for investigating nature and studying societies. They are considered to be the fundamental preparations and the preliminary procedures to a national economic development program. The basic functions of surveying and cartography include the determination of precise geographic coordinates, altitude and gravity data for all the control points and the publication of maps at various scales of China, thematic maps and map collections as well as surveying and mapping services for economic development, national defense construction, cultural education, scientific research, foreign affairs, border-area surveying, transportation, tourism and interior administration. In addition, performance of these tasks such as agricultural resource investigation and zoning, farmland water conservancy development, geological studies and mining surveys, the exploration and utilization of geothermal power, exploration of oil and coal fields, route surveying and the construction of railways and highways, hydrographic surveying and river control, earthquake prediction and advance warning, shoreline resource study and urban planning requires reliable survey data and maps provided by preliminary surveying and cartography services. G.L.C.

N86-12403# Joint Publications Research Service, Arlington, Va.
STATUS, DEVELOPMENT OF POWER ULTRASONICS IN CHINA c71
Zhang Fucheng and Cheng Cundi *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-035) 17 Oct. 1985 p 40-51 refs Transl. into ENGLISH from Yingyong Shengxue (Beijing), v. 4, no. 3, Jul. 1985 p 1-6 (For primary document see N86-12399 03-31)
Avail: NTIS HC A08/MF A01

Power acoustics and the utilization of rather high ultrasonic energy for cleaning, processing, ultrasonic therapeutics, surgery and other purposes are discussed. The frequencies used generally range from 10 kHz to 60 kHz (some are 1 MHz or more) with acoustic intensities ranging from O.X watts./sq. cm. to several hundred watts/sq. cm. (the figure is even higher for some special uses). Author

N86-12404# Joint Publications Research Service, Arlington, Va.
PLASMA ARC WELDING FOR THIN TITANIUM PLATES c37
Luo Jinru and Tang Xingli *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-035) 17 Oct. 1985 p 52-62 refs Transl. into ENGLISH from Shiyou Huagong Shebei (Lanzhou), v. 14, no. 4, 1985 p 11-16 (For primary document see N86-12399 03-31)
Avail: NTIS HC A08/MF A01

Techniques for flat and butt plasma arc welding are described for 3-mm-thick TAI industrial plates consisting of almost pure titanium. Welding techniques, standards, and equipment are selected experimentally, with special emphasis on the discharge of the plasma gas and the welding current, welding speed, and electric arc voltage. The parameter values recommended are compared with those for stainless steel plates, and it is concluded that the LH-300 plasma arc device can give excellent results in welding thin titanium and stainless steel plates, provided that the welding parameters and titanium and stainless steel plates, provided that the welding parameters and equipment quality are strictly controlled. Author

N86-12405# Joint Publications Research Service, Arlington, Va.
JAPANESE REPORT ON CHINA'S F-8 FIGHTER c08
Yu Yuebo *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-035) 17 Oct. 1985 p 70-72 Transl. into ENGLISH from Hangkong Zhishi (Beijing), no. 7, Jul. 1985 p 22-23 (For primary document see N86-12399 03-31)
Avail: NTIS HC A08/MF A01

A new Chinese-built fighter aircraft has been unveiled. This aircraft, which is named the F-8, has a delta wing and a horizontal tail; it probably has two engines, and its maximum speed is estimated to be greater than Mach2. According to the article 1983-1984 Military Balance, approximately thirty F-8 aircraft are currently in service in the Chinese Air Force. G.L.C.

N86-12406# Joint Publications Research Service, Arlington, Va.
THE 4-BIT MICROPROCESSOR CAPABILITIES, APPLICATIONS DESCRIBED c60

Miao Xiaosheng *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-035) 17 Oct. 1985 p 73-87 Transl. into ENGLISH from Dianzi Jishu Yingyong (Beijing), no. 5, 25 May 1985 p 40-45 (For primary document see N86-12399 03-31)
Avail: NTIS HC A08/MF A01

Production of China's 4-bit microprocessor circuits has currently reached the level of foreign developmental chips in the early 1980's. There are already several hundred units in China that have taken up applications with 4-bit microprocessors, and domestically produced 4-bit microprocessor circuits can already more or less fulfill domestic requirements. G.L.C.

N86-12407# Joint Publications Research Service, Arlington, Va.
MATHEMATICAL MODEL OF THE DYNAMIC RESPONSE OF THERMO-REGULATING IN 200 MeV LINEAR ACCELERATOR **c73**
Hu Defang and Ouyang Xiantai *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-035) 17 Oct. 1985 p 90-95 refs Transl. into ENGLISH from Zhongguo Kexue Jishu Daxue Xuebao (Hefei), v. 15, no. 2, Jun. 1985 p 217-222 (For primary document see N86-12399 03-31)
Avail: NTIS HC A08/MF A01

A 200 MeV electron linear accelerator is used as the injector for the 800 MeV electron synchrotron. The traveling wave cavity of the linear accelerator is a 2p1/3 model equal-impedance, disk-loaded waveguide. The power loss inside the waveguide attenuates exponentially along the length of the accelerator (in the x direction). G.L.C.

N86-12408# Joint Publications Research Service, Arlington, Va.
CHINA REPORT: SCIENCE AND TECHNOLOGY
11 Jun. 1985 167 p refs Transl. into ENGLISH from various Chinese articles
(JPRS-CST-85-017) Avail: NTIS HC A08/MF A01

Scientific and technological research in China is reported. The journal is divided into sections on national development, applied sciences, life sciences, environmental quality, and abstracts on armaments, genetics, lasers, oceanology, pharoacology and physics. Some articles of interest might be: determination of single mode optical fiber dispersion; microcomputer controlled closed loop system for positioning radio telescope; laser anemometer using a single circuit-boards; and the step structure effect of DC Josephson current within one flux quantum period. For individual titles, see N86-12409 through N86-12412.

N86-12409# Joint Publications Research Service, Arlington, Va.
DETERMINATION OF SINGLE-MODE OPTICAL FIBER DISPERSION **c74**
Zhou Wenjun *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-017) 11 Jun. 1985 p 42-51 refs Transl. into ENGLISH from Tongxin Xuebao (Beijing), v. 5, no. 3, Jul. 1984 p 95-101 (For primary document see N86-12408 03-31)
Avail: NTIS HC A08/MF A01

On the basis of theoretical analysis and a large number of numerical calculations, an approximate analytic formula is proposed to determine the dispersions of single mode optical fibers from the relative operating wavelength, the relative refractive index difference and the core radius of the fibers. Additionally, important parameters, such as the propagating constant and the ratio of power flow in the core of the single mode optical fibers, can also be calculated by means of the related formula given. Author

N86-12410# Joint Publications Research Service, Arlington, Va.
MICROCOMPUTER-CONTROLLED CLOSED-LOOP SYSTEM FOR POSITIONING RADIO TELESCOPE **c89**
Zhu Liqing, Chu Yingyi, and Zhang Zhenchao *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-017) 11 Jun. 1985 p 69-77 ref Transl. into ENGLISH from Wei Jisuanji Yingyong (Beijing), no. 4, Nov. 1984 p 26-30 (For primary document see N86-12408 03-31)
Avail: NTIS HC A08/MF A01

A millimeter range radio telescope is used to track and observe stars that emit radiation at radio frequencies. The horizontal system responsible for moving the principal receiving plane is equipped with servo systems for controlling the azimuthal position and pitch of the telescope. The telescope contains six servos which employ closed loop computer controlled positioners or automatic tracking and focusing. In order to match the servo systems to the basic requirements of the closed loop computer positioning system, a microprocessor based controller was designed and tested in experiments on the control of servo systems for regulating the principal and auxiliary planes of the telescope. Methods were studied for coordinating and correcting the system. This work is briefly described. Author

N86-12411# Joint Publications Research Service, Arlington, Va.
LASER ANEMOMETER USING A SINGLE CIRCUIT BOARD **c35**
Gu Weiyu, Han Shouchun, Song Zhengfang, Liu Xiaochun, Ding Qiang, and Qi Fudi *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-017) 11 Jun. 1985 p 78-85 Transl. into ENGLISH from Weijisuanji Yingyong (Beijing), no. 4, Nov. 1984 p 48-51 (For primary document see N86-12408 03-31)
Avail: NTIS HC A08/MF A01

Real time measurements of average wind velocities over ranges of a few hundred meters or more are important for the national economy and in scientific research; nevertheless, effective and economical measurement methods remain unavailable. We have designed a laser correlation anemometer which exploits the relationship between fluorescence induced by a laser beam traveling in air and the wind velocity in the path of the beam. The system measures the average vertical wind velocity in the path of the laser beam and employs a DBJ-80 single board computer; it makes full use of software capabilities and does not require modulus conversion systems. The device is light weight and easily transported, and tests show that accuracy of the measurements is highly satisfactory. Author

N86-12412# Joint Publications Research Service, Arlington, Va.
THE STEP STRUCTURE EFFECT OF dc JOSEPHSON CURRENT WITHIN ONE FLUX QUANTUM PERIOD phi SUB ZERO (2) **c33**
Zhang Yuheng, Shen Xiuling, Zheng Jiefei, and Wu Yan *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-017) 11 Jun. 1985 p 104-114 refs Transl. into ENGLISH from Wuli Xuebao (Beijing), v. 33, no. 8, Aug. 1984 p 1075-1083 (For primary document see N86-12408 03-31)
Avail: NTIS HC A08/MF A01

A large Josephson junction placed in a high-Q cavity whose rth eigen-mode is excited by the Josephson frequency omega = 2 eV sub zero/h, the oscillating electromagnetic field will feedback the junction and one must recognize that the spatial parts of the eigen-mode of the feedback field are not the same on the junction. Theoretical results were obtained differently from those of a previous researcher, and experimental results showing how the step structure current vary with the magnetic field. The match condition for eigen-mode of the feedback field from the cavity and electromagnetic field radiated by Josephson junction was worked out. Finally, the physical reason for the absence of step structure with period less than phi sub zero is given. Author

N86-12413# Joint Publications Research Service, Arlington, Va.
CHINA REPORT: SCIENCE AND TECHNOLOGY
12 Jun. 1985 188 p refs Transl. into ENGLISH from various Chinese articles
(JPRS-CST-85-018) Avail: NTIS HC A09/MF A01

Progress in Chinese science and technology is reported. Topics discussed include: national developments; applied sciences; life sciences; environmental quality; applied mathematics; chemistry; computer applications; electronics, optics; physics and thermodynamics. For individual titles, see N86-12414 through N86-12420.

N86-12414# Joint Publications Research Service, Arlington, Va.
STATE-OF-THE-ART OF OPTICS IN CHINA REVIEWED **c74**
Wang Daheng and Wo Xinneng *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-018) 12 Jun. 1985 p 50-65 refs Transl.

into ENGLISH from Guangxue Xuebao (Shanghai), v. 5, no. 1, Jan. 1985 p 1-10 (For primary document see N86-12413 03-31)
Avail: NTIS HC A09/MF A01

The state-of-the-art of optics and applied optics in China is reviewed. Developments in lasers, infrared and opto-electronic techniques, optical metrology, high-speed photography, holography and information processing, nonlinear optics, optical fiber communications and optical techniques are described. Further development of optics and applied optics in China are proposed. Author

N86-12415# Joint Publications Research Service, Arlington, Va.
SINGLE MODE PHASE LOCKING FIBEROPTIC SENSOR DEVELOPED **c74**
Wang Jinghua, Xie Haiming, Cui Jianhua, and Li Dazhong *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-018) 12 Jun. 1985 p 66-69 refs Transl. into ENGLISH from Yingyong Jiguang (Shanghai), v. 5, no. 1, Feb. 1985 p 43-44 (For primary document see N86-12413 03-31)
Avail: NTIS HC A09/MF A01

This paper reports a single mode phase locking strain sensor. With this sensor, earth shell deformation and solid tide could be detected. This sensor has greatly improved the measurement sensitivity. Author

N86-12416# Joint Publications Research Service, Arlington, Va.
PRACTICAL OPTICAL MULTICHANNEL ANALYZER DEVELOPED **c74**
Chen Jian, Li Weiliang, Wan Wanlun, Lin Weizhu, and Li Wenchong *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-018) 12 Jun. 1985 p 70-77 refs Transl. into ENGLISH from Yingyong Jiguang (Shanghai), v. 5, no. 1, Feb. 1985 p 45-48 (For primary document see N86-12413 03-31)
Avail: NTIS HC A09/MF A01

An optical multichannel analyzer of a simple construction is presented in this paper. The instrument includes a video camera, a microcomputer and some accessories. It can be used in the measurement of both transient laser optics and transient laser spectroscopy, as well as for conventional spectroscopic work.
Author

N86-12417# Joint Publications Research Service, Arlington, Va.
DEVELOPMENT OF BEAM OPTICS FOR A 200 keV ION IMPLANTER **c74**
Pan Xianzheng, Fan Xiangjin, Xu Zaigui, and Guo Huaigui *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-018) 12 Jun. 1985 p 78-88 refs Transl. into ENGLISH from Wuhan Daxue Xuebao (Wuhan), no. 4, Dec. 1984 p 35-40 and 56 (For primary document see N86-12413 03-31)
Avail: NTIS HC A09/MF A01

The beam optics of a 200 keV ion implanter is described in this paper. At present, this ion implanter is used to generate various ion beams of energy ranging from 20 to 200 keV at mass number A < or = 50. It is also used in studying semiconductors and metals. Ion implantation has been widely used in solid state physics and materials science. It is attractive to build a low energy ion accelerator with a wide tunable energy range which is capable of implanting a large number of ions and is suited for solid material implantation. The design of the ion beam optics system has embraced the merits of similar existing machines both at home and abroad. Author

N86-12418# Joint Publications Research Service, Arlington, Va.
CHARACTERISTIC VALUE AS AN ENERGY OUTPUT INDEX FOR EXPLOSIVES **c28**
Zhang Housheng and Zhang Shanshan *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-018) 12 Jun. 1985 p 89-98 refs Transl. into ENGLISH from Binggong Xuebao (Beijing), no. 1, Feb. 1984 p 36-42 (For primary document see N86-12413 03-31)
Avail: NTIS HC A09/MF A01

The characteristic value of an explosive and the method of computing it are described and equations for computing the detonation velocity, detonation pressure, specific kinetic energy of detonation products, specific impulse, dent depth, ballistic mortar value, cylinder-test specific kinetic energy, penetration depth, Gurney velocity and flying plate velocity are derived. These equations have some advantages over the existing equations. It is believed that the energy output index of an explosive should have a functional relationship to the detonation parameters and measures of explosive work. The characteristic value satisfies the requirements for an energy output index and may be so used.
Author

N86-12419# Joint Publications Research Service, Arlington, Va.
LONG WAVE (1.2 - 1.5 MICRONS) SEMICONDUCTOR LASERS **c36**
Pan Zhonghau, Yang Guisheng, Ran Chongzhu, Zhao Songshan, and Wang Yuzhang *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-018) 12 Jun. 1985 p 99-105 refs Transl. into ENGLISH from Tongxin Xuebao (Beijing), no. 1, Jan. 1984 p 68-71 (For primary document see N86-12413 03-31)
Avail: NTIS HC A09/MF A01

Long-wave semiconductors lasers are important light sources for high-capacity fiber-optic communication systems with long repeater spacings. Lasers with outputs at 1.2, 1.3 and 1.5 micrometer, power feedback and temperature feedback systems for them, and techniques for coupling their output into single-mode optical fibers are described. Author

N86-12420# Joint Publications Research Service, Arlington, Va.
COUPLING BETWEEN SPINOR FIELD, PROPAGATING TORSION **c39**
Xu Jizhong *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-018) 12 Jun. 1985 p 106-110 refs Transl. into ENGLISH from Wuhan Daxue Xuebao (Wuhan), no. 1, Mar. 1984 p 47-50 (For primary document see N86-12413 03-31)
Avail: NTIS HC A09/MF A01

An investigation is conducted of the coupling of the spinor field and propagating torsion. It is pointed out that there is no interaction between the spinor field and torsion in the HRRS theory, and in DG theory the action of torsion on Dirac particle is expressed as a modification of Dirac particle rest-mass and the torsion produced by the Sun makes a contribution of less than 2 x 10 to the 46th power U on the rest mass of the Dirac particle on the Earth. Einstein-Cartan gravitational theory is a natural extension of Einstein's gravitational theory. B.W.

N86-12421# Joint Publications Research Service, Arlington, Va.
CHINA REPORT: SCIENCE AND TECHNOLOGY
8 Jul. 1985 187 p refs Transl. into ENGLISH from various Chinese articles
(JPRS-CST-85-021) Avail: NTIS HC A09/MF A01

Various topics related to science and technology in China are discussed. Variational analysis of phase transition in pure lattice gauge fields, quantum chemistry of aromatic nitro explosives, pulsed radiation detection technology, and neodymium lasers are among the topics covered. For individual titles, see N86-12422 through N86-12429.

N86-12422# Joint Publications Research Service, Arlington, Va.
VARIATIONAL ANALYSIS OF PHASE TRANSITION IN PURE GAUGE FIELDS **c76**
Guo Shouhong, Liu Jinming, and Chen Qizhou *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-021) 8 Jul. 1985 p 76-84 refs Transl. into ENGLISH from Zhongshan Daxue Xuebao (Guangzhou), no. 4, Nov. 1984 p 48-54 (For primary document see N86-12421 03-31)
Avail: NTIS HC A09/MF A01

A modified mean field theory applying an improved variational action with mixed plaquette-like variables is used to study the phase transition of 4-dimensional pure lattice gauge systems. The theory gave the overall behavior of mean plaquette energies E sub p for U(2), U(3), SU(3) and SU(2) groups over a wide range of beta, including the phase transition or crossover region, and explained that the phase transitions in SU(2) and SU(3) pure lattice gauge systems are absent. The E sub p approx. = beta

curves agree with Monte Carlo results and are better than that given by simple mean field theory. Author

N86-12423# Joint Publications Research Service, Arlington, Va.
QUANTUM CHEMISTRY OF AROMATIC NITRO EXPLOSIVES **c28**
Xiao Heming, Wang Zunyao, and Yao Jianmin *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-021) 8 Jul. 1985 p 85-90 refs Transl. into ENGLISH from Huaxue Xuebao (Shanghai), v. 43, no. 1, Jan. 1985 p 14-18 (For primary document see N86-12421 03-31)
Avail: NTIS HC A09/MF A01

The stability of over 20 nitro derivatives of aminobenzene was studied by HMO and CNDO/2 methods. The results showed that, with increasing bond order of the C-NO2 bond, the impact sensitivity decreased. The delocalization energy criterion, using isolated double bond as reference, does not reflect the influence which positioning of functional groups has on the stability of the molecule. Its applications are limited to those conjugate systems in which the relative position of functional groups has negligible effects. As a criterion for determining the stability of this series of compound, the C-NO2 bond order is more appropriate and obvious than the often used delocalization energy. The use of the C-NO2 bond order criterion is also consistent with the mechanisms of impact initiation and thermal decomposition and also in agreement with Delpuech's deha C/iota criterion. Author

N86-12424# Joint Publications Research Service, Arlington, Va.
PULSED RADIATION DETECTION TECHNOLOGY DISCUSSED **c32**
Lu Min *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-021) 8 Jul. 1985 p 99-112 Transl. into ENGLISH from Hedianzixue Yu Tance Jishu (Beijing), v. 4, no. 6, Nov. 1984 p 321-328 (For primary document see N86-12421 03-31)
Avail: NTIS HC A09/MF A01

Various techniques and devices used to detect pulsed radiation are briely surveyed. A typical measurement system; the selection of a measurement system; the operation of scintillation counters, photoelectric multiplier tubes, and photocells are discussed. R.J.F.

N86-12425# Joint Publications Research Service, Arlington, Va.
NEW DUAL Z80 NAVIGATION COMPUTER DESCRIBED **c04**
Yu Shiquan, Zhang Chunbao, and Wu Shuwei *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-021) 8 Jul. 1985 p 113-122 refs Transl. into ENGLISH from Dianzi Jishu (Shanghai), v. 12, no. 1, 12 Jan. 1985 p 5-8 (For primary document see N86-12421 03-31)
Avail: NTIS HC A09/MF A01

The application of microprocessor based multiprocessing systems to ship navigation, particularily to position location, is discussed. Systems engineering, interprocessor communication, data display circuits, and the structure of computer programs are covered. R.J.F.

N86-12426# Joint Publications Research Service, Arlington, Va.
SUPERHEATED STEAM'S DENSITY COMPENSATION FOR FLOW MEASUREMENT **c34**
Xu Guanquan *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-021) 8 Jul. 1985 p 123-128 refs Transl. into ENGLISH from Huaxue Shijie (Shanghai), v. 26, no. 2, 20 Feb. 1985 p 61-63 (For primary document see N86-12421 03-31)
Avail: NTIS HC A09/MF A01

A method for steam flow measurement using an apertured plate as a flow regulation element is described. Conditions to be satisfied when using regular meters and the selection of meters are discussed. R.J.F.

N86-12427# Joint Publications Research Service, Arlington, Va.
TITANIUM-NITROGEN ION BEAM INJECTION STUDIED **c76**
Jiang Xingliu, He Lianlong, Jiang Songchuan, and Chen Kefan *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-021) 8 Jul. 1985 p 129-131 refs Transl. into ENGLISH from Lanzhou Daxue Xuebao (Lanzhou), v. 20, no. 4, 28 Dec. 1984 p 123-124 (For primary document see N86-12421 03-31)
Avail: NTIS HC A09/MF A01

It is well known that titanium alloys and titanium compounds have such excellent properties as heat resistance, corrosion resistance, great strength and great hardness. If a layer of titanium-nitrogen ions is injected onto the surface of steel to form TiN and Ti2N layer, it should greatly improve the properties of the material. Preliminary studies on pulse titanium-nitrogen ion beam injection onto steel surface were carried out by using multiple plate electrode capacitor for low pressure gas, which is based on the principle of progressively electric field. The distribution profile of titanium, nitrogen, oxygen and carbon within the steel was analyzed by PHI-550 electronic spectroscopy. It is seen that titanium and nitrogen have similar atom concentration distribution versus depth. The concentration distributions of titanium and nitrogen can be seen as being similar on the picture from surface line scanning. The results from corrosion resistance experiments confirm that corrosion resistance and hardness of the injected surface have been notably improved. Author

N86-12428# Joint Publications Research Service, Arlington, Va.
HIGH-POWER ND: GLASS LASER AND TARGET CHAMBER SYSTEM AND AN EXPERIMENTAL STUDY OF LASER PLASMA X-RAY **c36**
Wu Hongxing, Guo Dahao, Zhou Yusheng, Zhang Limin, He Weimin, and Dai Yusheng *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-021 8 Jul. 1985 p 132-140 refs Transl. into ENGLISH from Zhongguo Kexue Jishu Daxue Xuebao (Hefei), v. 15, no. 1, Mar. 1985 p 30-36 (For primary document see N86-12421 03-31)
Avail: NTIS HC A09/MF A01

The structure and characteristics of a high power Nd:glass laser and target chamber system is described. The system was used in the experimental study of laser plasma X-ray (LPXO) to obtain photographs of hydrogen-like and helium-like X-ray spectra of Mg and Na. The electron temperature reached one million degrees K. The results demonstrated that the Nd:glass laser and target chamber system can be used in the study of laser plasma and other related subjects. Author

N86-12429# Joint Publications Research Service, Arlington, Va.
TITANIUM EXTRACTANT T105-1 STUDIED **c26**
Mu Guangzhao *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-021) 8 Jul. 1985 p 141-144 Transl. into ENGLISH from Huaxue Shijie (Shanghai), v. 26, no. 3, 20 Mar. 1985 p 82-83 (For primary document see N86-12421 03-31)
Avail: NTIS HC A09/MF A01

The phase ratio (organic phase/aqueous phase) and the influence of extraction time on extraction rate in the extractions by T105-1 of titanium-sulfuric acid solutions of various concentrations were studied. Extractions were done at room temperature. R.J.F.

N86-12430# Joint Publications Research Service, Arlington, Va.
CHINA REPORT: SCIENCE AND TECHNOLOGY
1 Oct. 1985 166 p refs Transl. into ENGLISH from various Chinese articles
(JPRS-CST-85-034) Avail: NTIS HC A08/MF A01

Progress in Science and Technology in the People's Republic of China is reported. The following topics are discussed, physical sciences, applied sciences, applied mathematics, chemistry, data processing, seismology, electronics, information systems, lasers, mathematics, microbiology, nuclear power, physical chemistry, and semiconductors. For individual titles, see N86-12431 through N86-12438.

N86-12431# Joint Publications Research Service, Arlington, Va.
LASER SCATTERING IN PLASMA EXAMINED **c36**
Lu Quankang, Chen Hang, Yin Qi, and Wang Wenhua *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-034) 1 Oct. 1985 p 49-52 refs Transl. into ENGLISH from Ziran Zazhi (Shanghai), v. 7, no. 7, Jul. 1984 p 555-557 (For primary document see N86-12430 03-31)

Avail: NTIS HC A08/MF A01

On the basis of the work of Rostoker and Rosenbluth, the laser scattering spectrum in plasma was modeled by taking the Coulombic force as well as the Lorentz force into account utilizing a heuristic particle model. The calculation was made on the total electromagnetic force interaction between charged particles in the presence of an external magnetic field. E.A.K.

N86-12432# Joint Publications Research Service, Arlington, Va.
OPTIC FIBER APPLICATIONS IN DATA COMMUNICATIONS c32

Yu Huaiquan and Lu Zinan *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-034) 1 Oct. 1985 p 53-58 Transl. into ENGLISH from Dianzi Jishu (Shanghai), v. 12, no. 5, 20 May 1985 p 15-17; 19 (For primary document see N86-12430 03-31)

Avail: NTIS HC A08/MF A01

Progress in data communications systems which link together computers and terminal equipment with communications circuits to accomplish information transfer, exchange, and processing are discussed. This shared resources type of communications was developed along with the broader applications of computers, and is the third largest mode of communications continuing upon analog communications and PCM digital communications. The development in China of fiber optics for transmission in computer networks is reported. E.A.K.

N86-12433# Joint Publications Research Service, Arlington, Va.
EXPERIMENTS WITH DOMESTIC IC SUBSTRATES c33

Guan Shuzhu and Li Dunfu *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-034) 1 Oct. 1985 p 59-66 refs Transl. into ENGLISH from Dianzi Jishu (Shanghai), v. 12, no. 5, 20 May 1985 p 12-14 (For primary document see N86-12430 03-31)

Avail: NTIS HC A08/MF A01

The requirement for the development of low cost, highly reliable IC circuits in millimeter wave precision tactical weapons are discussed. Different forms for such circuits are proposed: (1) microstrip circuits; (2) waveguide surface circuits, (3) dielectric waveguides; and (4) fin-line. The millimeter wave microstrip circuits require a medium with low dissipation and a low dielectric constant. The waveguide surface circuits were used in the X-band. The main problem is that there is only one conductor line. The electric waveguides were used successfully in the millimeter band. The primary problem is the incompatibility introduced by the single guidestrip with active devices, and the transient conversion from square waveguides is also too long. Fin-lines have attracted attention because of their moderate transmission loss, convenient transition, variable ciruits modes (ridge line, trough line, coplaner lines, and waveguide microstrips), multiple guide strip compatibility, and especially the convenience of installation with active devices. E.A.K.

N86-12434# Joint Publications Research Service, Arlington, Va.
BLR STUDIES ON CONIC MODEL WITH LDA IN FL-1 WIND TUNNEL c02

Zhong Zhan and Yu Yong *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-034) 1 Oct. 1985 p 67-70 Transl. into ENGLISH from Guoji Hangkong (Beijing), no. 6, Jun. 1985 p 9-10 (For primary document see N86-12430 03-31)

Avail: NTIS HC A08/MF A01

Boundary layer velocity measurement over a cone using laser (LDA) was studied in the FL-1 wind tunnel of the Shengyang Aerodnamics Research Institute. Velocity distributions at two cross-sections of the boundary layer of a 20 deg conic model under different Mach numbers are measured. The measured results are in agreement with theoretical calculations. E.A.K.

N86-12435# Joint Publications Research Service, Arlington, Va.
MEASUREMENT OF 1 NANOSECOND WIDE BEAMS FOR 2.5 MeV PROTON ACCELERATOR c72

Yang Jiayou, Li Wenxue, and Li Jiarong *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-034) 1 Oct. 1985 p 71-77 refs Transl. into ENGLISH from He Kexue Yu Gongcheng (Beijing), no. 1, Mar. 1984 p 67-71 (For primary document see N86-12430 03-31)

Avail: NTIS HC A08/MF A01

A measuring method for beam burst with extremely narrow width of 1 ns for a 2.5 MeV proton electrostatic accelerator is described. The measurement results are given. The system consists of a long coaxial target (wideband Faraday cup), a subnanosecond pulse amplifier (t sub x < 0.4 ns) and a sampling oscilloscope (Type AQ10). It is pointed out that secondary emissions from the target knocked by the beam have almost no effect on the waveform of the beam pulse. E.A.K.

N86-12436# Joint Publications Research Service, Arlington, Va.
MATHEMATICAL PRINCIPLE FOR GENERATING SECOND-ORDER ASPHERICAL SURFACE c64

Pan Junhua and Wang Jinaguo *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-034) 1 Oct. 1985 p 78-84 ref Transl. into ENGLISH from Guangxue Xuebao (Shanghai), v. 4, no. 3, Mar. 1983 p 252-256 (For primary document see N86-12430 03-31)

Avail: NTIS HC A08/MF A01

The mathematical formulas for generating second order aspherical surfaces were derived. The aspherical surface is treated as an envelope of spheres with different radius of curvature at different zones; delta sub p and alpha sub p are taken as parameters to describe the motion of grinding tool, where delta sub p is the distance between vertex of surface and lowest point of the tool; and alpha sub p is the angle between tool axis and aspherical surface axis. For mass production, pure mechanism is better than computer control of the grinding machine, and the best mechanism is cam pair, because this mechanism can repeat the grinding process and to produces a smooth aspherical surface, to give the mathematical equations of the cam design. E.A.K.

N86-12437# Joint Publications Research Service, Arlington, Va.
SUPERCONDUCTING WIRE MANUFACTURED c33

Fu Yuexian, Sun Yue, Xu Shiming, and Peng Ying *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-034) 1 Oct. 1985 p 85-86 refs Transl. into ENGLISH from Diwen Wuli (Beijing), v. 7, no. 2, Jun. 1985 p 164-165 (For primary document see N86-12430 03-31)

Avail: NTIS HC A08/MF A01

The MF Nb/Cu Extrusion Tube Method was used to manufacture 3 kg of stable practical MF Nb2Sn composite superconducting wire containing pure Cu(RRR approx. 200)/Ta. The draw state composite wire diameter was 0.56 mm, it contained 11,448 x 2.6 micron Nb core, and the twist distance was 1.5 cm. The composite wire cross-section was pure Cu/Ta/11,448 Nb core/Cu/91Sn-Cu; containing 22.8 v. % pure Cu, 13.3 v. % Ta; within the Ta layer to prevent Sn diffusion. The wire was sheathed in nonalkaline glass fiber as an insulating layer. A section of wire weighing 160 g was cut off and coiled it into a small solenoid. After reaction diffusion processing at 675 C/30 and curing by vacuum dipping in paraffin, it was measured in a Nb-Ti backfield of 7.2 T intensity, a current of 129 A was passed through the Nb3Sn solenoid and produced a strength of 2.5 T, the overall magnetic field intensity of the composite magnet reached 9.7 T. At this time, the wire full current density J sub c.w. = 5.2 x 10 to the 4th power A/sq cm; the effective current density J sub c (Nb + Sn - Cu) = 8.2 x 10 to the 4th power A/sq cm. E.A.K.

N86-12438# Joint Publications Research Service, Arlington, Va.
ULTRAHIGH VACUUM EQUIPMENT DESCRIBED c35

Li Yuzhi, Jing Shiqun, and Peng Xianhui *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-034) 1 Oct. 1985 p 87-91 Transl. into ENGLISH from Diwen Wuli (Beijing), v. 7, no. 2, Jun. 1985 p 166-168 (For primary document see N86-12430 03-31)

Avail: NTIS HC A08/MF A01

Ultrahigh vacuum equipment for filming with a blockade value and a substrate at the temperature of liquid nitrogen. The equipment has the following characteristics: (1) the vacuum chamber is exposed to the atmosphere, the lockade valve can maintain a vacuum of 1 to 10 to the -9 power torr for a long period of time;

(2) it greatly reduces the working cycle compared to before the blockade valve was installed; and (3) the temperature of the sample substrate in the vacuum chamber can be adjusted continuously between 77 K and room temperature. The ultrahigh vacuum filming equipment China now produces does not have an ultrahigh vacuum valve, when inserting and removing samples, the pump casing is exposed to the atmosphere so that even after the pump has operated for a time, its limited vacuum is 10 to the -8 power torr. A bakeable metallic blockade valve is installed between the vacuum pump intake and the vacuum chamber to form a fliming device. The device is simple, the vacuum is increased several levels, and it can make samples at different substrate temperatures. E.A.K.

N86-12439# Joint Publications Research Service, Arlington, Va.
CHINA REPORT: SCIENCE AND TECHNOLOGY
11 Jul. 1985 190 p refs Transl. into ENGLISH from various Chinese articles
(JPRS-CST-85-022) Avail: NTIS HC A09/MF A01

Topics discussed in this China Report included: science and Technology (11 July 1985); contains articles from the scientific literature of the People's Republic on national devlopment, applied sciences, life sciences, acoustics, environmental quality, chemical industry chemistry, computers, control systems, electronics, lasers, marine science, and medicine. Of particular interest in this issue are articles on a piezoelectric sensor, microcomputerization, and CMOS circuitry. For individual titles, see N86-12440 through N86-12443.

N86-12440# Joint Publications Research Service, Arlington, Va.
CHINA'S FIRST IMPORTED PERIPHERAL EQUIPMENT PRODUCTION LINE **c35**
In its China Rept.: Sci. and Technol. (JPRS-CST-85-022) 11 Jul. 1985 p 17-25 Transl. into ENGLISH from Jisuanji Shijie (Beijing), no. 11, 8 Jun. 1984 p 1 (For primary document see N86-12439 03-31)
Avail: NTIS HC A09/MF A01

The piezoelectric gyroscope is a new type of solid-state inertia sensor which utilizes crystal piezoeffect sensitive angle parameters. The piezoelectric gyroscope has eliminated the rotating part of the traditional gyroscope and thus obtained an important breakthrough in gyroscope life, the device can operate for over 10,000 hours. Author

N86-12441# Joint Publications Research Service, Arlington, Va.
METHOD OF USING CTC TO MICROCOMPUTERIZE DIGITAL INSTRUMENTS **c35**
Wu Naiyou *In its* China Rept.: Sci. and Technol. 11 Jul. 1985 p 26-31 Transl. into ENGLISH from Dianzi Kexue Jishu (Beijing), v. 15, no. 1, 10 Jan. 1985 p 5-6 (For primary document see N86-12439 03-31)
Avail: NTIS HC A09/MF A01

This article introduces a method of borrowing the Z80 single-board computer CTC to microcomputerize digital instruments. While preserving all the functions of the single-board computer, this method fully exploits software potential, simplifies hardware design and is characterized by high precision, high reliability, low cost, and ease of extension. Author

N86-12442# Joint Publications Research Service, Arlington, Va.
DIGITAL PHASE METER USING CMOS-LED INTRODUCED **c35**
Tan Benzhi *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-022) 11 Jul. 1985 p 32-34 Transl. into ENGLISH from Dianzi Kexue Jishu (Beijing), v. 15, no. 1, 10 Jan. 1985 p 25 and 28 (For primary document see N86-12439 03-31)
Avail: NTIS HC A09/MF A01

The structure of the CMOS-LED digital phase meter introduced in this paper is simple, its performance is stable, it is suitable for phase testing of low frequency signals, there are no strict demands on the wave form of the tested signal, sine waves, triangular waves, and square waves can be measured, and the tested signal can be in the 0.2V - 300V range. In addition to carrying out phase testing of small signals, through attenuation switch conversion, it can be used to measure the phase difference of three-phase service power supplies, is much easier to observe than a phase sequencer, and measurement error is + or - 1%. Author

N86-12443# Joint Publications Research Service, Arlington, Va.
LATCH-UP EFFECT IN CMOS DESCRIBED **c33**
Zhang Lichun, Yan Timing, Ni Xuewen, Yan Guizhen, Feng Chuguang, and Zhang Ziang *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-022) 11 Jul. 1985 p 35-41 refs Transl. into ENGLISH from Dianzi Kexue Jishu (Beijing), v. 15, no. 1, 10 Jan. 1985 p 2-4 (For primary document see N86-12439 03-31)
Avail: NTIS HC A09/MF A01

The latch-up effect was first discovered in a small-scale bipolar integrated circuit. As long as there are parasitic four-layer PNPN structures, under certain conditions, the latch-up effect can occur. Since bulk CMOS circuits are of four-layer structure, the latch-up effect is a failure mode which often occurs in them. With the improvement of integration and the reduction in component dimensions, the latch-up effect can become increasingly serious. Therefore, how to reduce or eliminate the latch-up effect and improve the reliability of CMOS circuits is a subject which has been getting more and more attention. The latch-up phemonenon in CMOS circuits is discussed, the conditions which produce it are analyzed, and proposals for preventative measures in design, industrial technology, and use are made. Author

N86-12444# Joint Publications Research Service, Arlington, Va.
CHINA REPORT: SCIENCE AND TECHNOLOGY
1 Aug. 1985 82 p refs Transl. into ENGLISH from various Chinese articles
(JPRS-CST-85-025) Avail: NTIS HC A05/MF A01

Advances in science and technology from the Peoples Republic of China are reported. Topics of discussion include: (1) national developments; (2) allied sciences; (3) life sciences; (4) environmental quality; (5) atomic energy; (6) chemistry; (7) energy; (8) engineering; (9) medicine; (10) microbiology; (11) nuclear engineering; (12) oceanography; and (13) physics. For individual titles, see N86-12445 through N86-12445.

N86-12445# Joint Publications Research Service, Arlington, Va.
NEW APPROACHES TO DETERMINING PHYSICAL PROPERTIES IN PISTON-CYLINDER HIGH-TEMPERATURE, HIGH-PRESSURE DEVICE
Zhang Yun, Shen Zhongyi, Yin Xiujun, Chu Shaoyan, and He Shouan *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-025) 1 Aug. 1985 p 14-22 refs Transl. into ENGLISH from Wuli (Beijing), v. 13, no. 12, Dec. 1984 p 714 and 742-745 (For primary document see N86-12444 03-31)
Avail: NTIS HC A05/MF A01

High pressure has a unique effect and significant in basic and applied research in solid state physics. Measurement of physical properties under high pressure is the means of high pressure research. Its major content is how to produce various high pressure devices and measurement techniques so as to apply various measurement principles to the high pressure environment and eliminate or at least greatly dampen the interference which a high temperature and high pressure environment has on measurement so as to prevent measurement loss as well as guarantee the required precision of measurement. The merits of piston cylinder containers are: the structure is simple, the determination of pressure and temperature is accurate, and it is easy to bring measuring leads directly out of the high pressure cavity. Thus, one can efficiently and conveniently measure many kinds of behavior under high temperature and high pressure. G.L.C.

N86-12446# Joint Publications Research Service, Arlington, Va.
CHINA REPORT: SCIENCE AND TECHNOLOGY
3 Sep. 1985 171 p refs Transl. into ENGLISH from various Chinese articles
(JPRS-CST-85-029) Avail: NTIS HC A08/MF A01

Numerous topics related to science and technology in China are discussed. The progess of inertial confinement research, a

programmer for a single chip microprocessor, digital voltmeter technology acquisition wing tip sails on the Y-5 aircraft are among the topics discussed. For individual titles, see N86-12447 through N86-12450.

N86-12447# Joint Publications Research Service, Arlington, Va.
PROGRESS OF INERTIAL CONFINEMENT RESEARCH DETAILED **c75**
Wang Ganchang *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-029) 3 Sep. 1985 p 1-17 refs Transl. into ENGLISH from He Kexue Yu Gongcheng (Beijing), v. 4, no. 4, Dec. 1984 p 289-302 (For primary document see N86-12446 03-31)
Avail: NTIS HC A08/MF A01

Recent progress of inertial confinement fusion (ICF) research is discussed. The cannonball target, the high power krypton fluoride (KrF) laser, the ion beam diode, and the imploding foil plasma are discussed. The principle of the cannonball target, its advantages over ordinary ablation targets, and the problem of hole sealing are discussed. The powerful KrF excimer lasers pumped by electron beams are discussed. This type of laser is now generally regarded as one of the more promising drivers for ICF. The complex kinetics of pumping, quenching, radiation, and absorption of this very interesting laser are discussed. The present status of ion beam production, especially the diodes which produce the ion beams are covered. Three types of diodes are discussed: the pinch reflec diode (PRD), the diode with an externally applied magnetic field, and the hybrid amphion diode. Finally, the impliding foil plasma is considered. This technique produces plasmas of very high temperature and very intense soft X-rays which may either be used to produce an X-ray laser or as a new driver for ICF. R.F.J.

N86-12448# Joint Publications Research Service, Arlington, Va.
PROGRAMMER FOR SINGLE-CHIP MICROPROCESSOR **c60**
Li Benren, Gong Ganghua, and Meng Qi *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-029) 3 Sep. 1985 p 29-40 refs Transl. into ENGLISH from Xiaoxing Weixing Jisuanji Xitong (Shenyang), no. 1, 8 Jan. 1985 p 8-15 (For primary document see N86-12446 03-31)
Avail: NTIS HC A08/MF A01

The 8748/8741/8755 single chip microprocessor programming part of the TRS-80(I)/EG3200 on-line software development system is discussed. This program can read the internal read-only memory (ROM) and program the internal EPROM of the 8748/8749, 8741/8742 and 8755 chips. It is a development tool for single chip microprocessors which is very convenient, reliable and has powerful functions. Author

N86-12449# Joint Publications Research Service, Arlington, Va.
DIGITAL VOLTMETER TECHNOLOGY ACQUISITION **c35**
Chen Qilin and Cui Jianping *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-029) 3 Sep. 1985 p 41-44 Transl. into ENGLISH from Guoji Maoyi (Beijing), no. 3, 1985 p 33-34 (For primary document see N86-12446 03-31)
Avail: NTIS HC A08/MF A01

China began its development of digital voltmeter at a fairly early stage. In 1965, the Beijing Radio Technology Research Bureau had already built a 5 digit voltmeter whose technical performance was comparable to the international standards at that time. However, at the present time, of the more than 50 models of 5 digit voltmeters produced by State designated factories, only 2 or 3 use the international standard interface and microcomputer technology; furthermore, due to the limited capability in processing, equipment and testing, they cannot be mass produced. As a result, the gap between the Chinese standard and international standard in digital voltmeter is further widened. The Beijing Radio Technology Institute prepared a plan to import the manufacturing technology of the 8520A digital system multimeters from the U.S. FLUKE Co., by using foreign exchange funds designated for mechanical and electrical instruments under the joint technology and trade program. In September 1981, an official contract and an agreement for technology cooperation were signed. The items imported to the 8520A technology and trade program can be divided into several stages: (1) import automated test and standard systems which are built using advanced technologies of the 1980's; (2) train personnel and begin production; (3) import key production equipment to coordinate with China's existing facilities; (4) modify the production lines based on FLUKE's advanced technology and begin CKD production; and (5) use the results of imported technologies in other research projects to stimulate development in related technologies. R.J.F.

N86-12450# Joint Publications Research Service, Arlington, Va.
WINGTIP SAILS TESTED ON Y-5 AIRCRAFT **c05**
Yang Daxi *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-029) 3 Sep. 1985 p 49-53 Transl. into ENGLISH from Guoji Hangkong (Beijing), no. 5, May 1985 p 2-3 (For primary document see N86-12446 03-31)
Avail: NTIS HC A08/MF A01

In recent years, much attention has been given to the use of wingtip ailerons or wing tip sails to reduce induced drag because for most transport airplanes, the induced drag at cruising speed is approximately 30 percent of the total drag; at lower speeds the ratio is even higher. For the Y-5 biplane, the induced drag to total drag ratio is approximately 55.6 percent, at cruising speed the ratio is approximately 33 percent, and during climb it is 58 percent. Therefore, wing tip ailerons or wing tip sails potentially can be very effective in reducing the overall drag of the aircraft. Since a large number of Y-5 airplanes are used in China for a variety of applications, a research program was initiated in August 1982 to install and test wing tip sails on the Y-5 aircraft. Results show that the use of wing tip sails improved the performance of the Y-5 aircraft. Author

N86-12451# Joint Publications Research Service, Arlington, Va.
CHINA REPORT: SCIENCE AND TECHNOLOGY
4 Sep. 1985 154 p refs Transl. into ENGLISH from various Chinese articles
(JPRS-CST-85-030) Avail: NTIS HC A08/MF A01

Research in science and technology of China is reported. Most articles are contained in the applied sciences section of the journal, with a small section devoted to life sciences. The abstracts section covers many areas including applied mathematics, chemistry, electronics, cryogenics, information science and lasers. The listing of articles include: computer aided analysis of arbitrary shaped thin wire antennas; uses of organic membranes in electrolytic industry; and a high repetition rate ultrashort pulse laser. For individual titles, see N86-12452 through N86-12458.

N86-12452# Joint Publications Research Service, Arlington, Va.
COMPUTER-AIDED ANALYSIS OF ARBITRARY-SHAPED THIN-WIRE ANTENNAS **c32**
Hong Wei and Zhang Wenxun *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-030) 4 Sep. 1985 p 15-23 refs Transl. into ENGLISH from Nanjing Gongxueyuan Xuebao (Nanjing), no. 4, 20 Dec. 1984 p 61-67 (For primary document see N86-12451 03-31)
Avail: NTIS HC A08/MF A01

The analysis of excited and loaded arbitrary shaped thin wire antennas was carried out. The numerical results for a GAUSS-type antenna agree with the experimental results. A triangular pulse base function and Galerkin method is used, the computational formulas obtained are simple and accurate, the computer program is easy to use as a subprogram call in an optimization program. Author

N86-12453# Joint Publications Research Service, Arlington, Va.
USAGES OF ORGANIC MEMBRANES IN ELECTROLYTIC INDUSTRY DESCRIBED **c25**
Li Jisen *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-030) 4 Sep. 1985 p 25-35 refs Transl. into ENGLISH from Huaxue Tongbao (Beijing), no. 5, 18 May 1985 p 37-42 (For primary document see N86-12451 03-31)
Avail: NTIS HC A08/MF A01

Electrosynthesis is a method of preparing chemical products through eletrode reactions. In recent years rapid advances have

been made in the area of organic compound preparation. Industrial scale productions were achieved on the preparation of adiponitrile by dimerization of acrylonitrile through electro-reduction, as well as the preparation of tetraethyllead and the preparation of propylene oxide from propylene. In these electrosyntheses, the applications of organic membranes have significant impacts. Due to these applications, the variety of membranes were greatly enriched, their properties improved and many chemical reactions were realized that are impossible under ordinary conditions. These syntheses and the role played by organic membranes are described. Author

N86-12454# Joint Publications Research Service, Arlington, Va.
EFFECT OF AMPLIFIED SPONTANEOUS EMISSION ON SPACE COHERENCE OF XeCl LASER **c36**
Zhang Dake, Wang Xiaoyi, Ni Jinzhi, Yao Jianping, Fu Shufen, and Chen Jianwen *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-030) 4 Sep. 1985 p 36-44 refs Transl. into ENGLISH from Zhongguo Jiguang (Shanghai), v. 12, no. 5, 20 May 1985 p 261-265 (For primary document see N86-12451 03-31)
Avail: NTIS HC A08/MF A01

Amplified Spontaneous Emission (ASE) is the single pass wave amplification caused by the propagation of spontaneous emission through a stimulated medium which has already reached the state of particle number reversal. Since first observed the ASE output from a pulse He-Ne laser with no cavity mirror, several researchers have conducted both theoretical and experimental studies on amplified spontaneous emissions. But so far no systematic studies have been reported on the effect of ASE on the output characteristics of excimer laser; such effect is clearly important in high gain excimer systems. This particular issue is explored. Author

N86-12455# Joint Publications Research Service, Arlington, Va.
FIRST DOMESTIC HIGH REPETITION RATE ULTRASHORT PULSE LASER **c36**
Guang Lin *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-030) 4 Sep. 1985 p 45 Transl. into ENGLISH from Zhongguo Jiguang (Shanghai), v. 12, no. 5, 20 May 1985 p 278 (For primary document see N86-12451 03-31)
Avail: NTIS HC A08/MF A01

On 7 February 1985, certification tests were conducted on the High Repetition Rate Ultrashort Pulse Laser. Experts at the meeting pointed out that this was China's first prototype high repetition rate ultrashort pulse laser. Its performance is higher than that of similar lasers in this country and is comparable to the advanced standards of foreign products. The energy of the pulse train of this laser is greater than 8 mJ; its single pulse width is 32 ps; its pulse stability is + or - 2 percent at 10 pps and + or - 4 percent at 33 pps; and its mode locked probability is 100 percent. The repetition rates are 10 pps, 20 pps, and 33 pps. The laser not only has a smooth pulse waveform, but its operation is stable and highly reliable. The high repetition rate ultrashort pulse laser is a valuable tool in the study of ranging and spectral techniques; it can be used to improve the measurement accuracy of ranging devices on third generation artificial satellites, and to increase the time resolution of laser spectral analysis. Author

N86-12456# Joint Publications Research Service, Arlington, Va.
PRACTICAL EXCIMER LASER DEVELOPED **c36**
Qun Li *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-030) 4 Sep. 1985 p 46 Transl. into ENGLISH from Zhongguo Jiguang (Shanghai), v. 12, no. 5, 20 May 1985 p 297 (For primary document see N86-12451 03-31)
Avail: NTIS HC A08/MF A01

After nearly 3 years of research and continuous improvement of its experimental equipment, a practical excimer laser was developed with the following properties: single pulse output energy 280 mJ, wavelength 3080 A. Its repetition rate can be adjusted between 0 to 10 Hz, its average output power is 1 w, and its single charge life exceeds 100,000 firings. The gas replacement equipment can operate at the following bands: ArF (1930 A), KrF (2490 A), N2 (3371 A), and XeF (3511 A). This equipment is also structurally very simple, and can operate reliably over a long period. Its price is only one-fourth to one-fifth of similar foreign products. This highly coherent ultraviolet source which has a constant average power is a useful tool for research in photochemistry, pump dye lasers, surface physics, and laser medicine. Author

N86-12457# Joint Publications Research Service, Arlington, Va.
A HIGH PRECISION RATE DYE LASER PUMPED BY A CuCl LASER **c36**
Jing Chunyang, Zhang Guiyan, Wu Zhengliang, Shu Juping, Hu Qiquan, Ying Lifeng, and Lin Fucheng *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-030) 4 Sep. 1985 p 47-53 refs Transl. into ENGLISH from Zhongguo Jiguang (Shanghai), v. 12, no. 7, 20 Jul. 1985 p 394; 399-401 (For primary document see N86-12451 03-31)
Avail: NTIS HC A08/MF A01

Experimental results of several high repetition rate Rhodamine dye lasers pumped by a CuCl laser are presented. The laser radiation covers a wavelength range of 5630 A to 6320 A and has a maximum conversion efficiency of 33 percent. Author

N86-12458# Joint Publications Research Service, Arlington, Va.
HUMAN HEMODYNAMIC CHANGE UNDER HIGH ATMOSPHERIC PRESSURE **c52**
Zhang Hengdu and Dai Duanyang *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-030) 4 Sep. 1985 p 55-56 Transl. into ENGLISH from Jiefangjun Yixue Zazhi (Beijing), no. 1, 20 Feb. 1985 p 63 (For primary document see N86-12451 03-31)
Avail: NTIS HC A08/MF A01

For the purpose of observing human hemodynamic change under high atmospheric pressure, nontraumatic means were adopted to record sphygmograms during a 26 day continuous nitrogen-oxygen saturation dive simulation trial 36.5 m. The test subjects assumed a supine position and the sphygmogram was recorded on closed vessels on the left side using a mercurial sphygmomanometer to measure blood pressure in the arteria brachialis of the left arm. The data from the initial measurements was processed through electronic computer. The voluntary test subjects were seven young males averaging 22.6 + or - 3.9 years of age. The simulated pressure measured 4.65 ATA, cabin temperature was 26.05 + or - 0.8 deg C and relative humidity measured 70.3 + or - 0.9 percent. Differential pressure measured 0.31 + or - 0.08 ATA for oxygen, 0.002 ATA for carbon dioxide and 4.34 ATA for nitrogen. The subjects lived and worked under the above conditions for 26 continuous days and nights and underwent 4 days of decompression to return to normal pressure. The results of these tests are briefly decribed. Author

N86-12459# Joint Publications Research Service, Arlington, Va.
CHINA REPORT: SCIENCE AND TECHNOLOGY
15 Aug. 1985 127 p refs Transl. into ENGLISH from various Chinese articles
(JPRS-CST-85-026) Avail: NTIS HC A07/MF A01

Advances in science and technology from the Peoples Republic of China are reported. Topics of discussion include: (1) national developments; (2) applied sciences; (3) life sciences; (4) scientists and scientific organizations; (5) acoustics; (6) applied mathematics; (7) atomic energy; (8) electricity; (9) engineering; (10) marine science; (11) nuclear physics; (12) physics; and (13) technical physics. For individual titles, see N86-12460 through N86-12461.

N86-12460# Joint Publications Research Service, Arlington, Va.
LASER INDUCED BIOLOGICAL HEATING ANALYZED **c36**
Liu Puhe *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-026) 15 Aug. 1985 p 71-76 refs Transl. into ENGLISH from Zhongguo Jiguang (Shanghai), no. 11, 20 Nov. 1984 p 697-700 (For primary document see N86-12459 03-31)
Avail: NTIS HC A07/MF A01

A quantitative analysis of the vaporization of tumors by pulsed CO2 lasers, incision by CW CO2 lasers, tissue coagulation by argon lasers, thermal killing of cancerous cells by He-Ne lasers, and the application of heat by CO2 lasers is presented. Although

the calculations are based on a simplified skin model, it may prove useful in clinical treatments. Author

N86-12461# Joint Publications Research Service, Arlington, Va.
APPLICATION OF HEAT-SCAN NDT TO INSPECTION OF ADHESION OF SOLID ROCKET MOTOR PROPELLANT TO ENVELOPE **c28**
Tian Enrui *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-026) 15 Aug. 1985 p 77-80 Transl. into ENGLISH from Harbin Gongye Daxue (Harbin), no. 1, Mar. 1985 p 74-83 (For primary document see N86-12459 03-31)
Avail: NTIS HC A07/MF A01

Heat-scan infrared nondestruction testing technology is an effective method to inspect solid rocket motors for defects in propellant adhesion to the envelope. The basic principles of heat-scan infrared NDT are introduced. Specifically, the theoretical basis of the heat-scan method is to detect internal defects of an object by measuring the infrared radiation from its surface and calculating the surface temperature distribution so that distortions in temperature pattern can be identified. Author

N86-12462# Joint Publications Research Service, Arlington, Va.
CHINA REPORT: SCIENCE AND TECHNOLOGY
19 Sep. 1985 156 p refs Transl. into ENGLISH from various Chinese articles
(JPRS-CST-85-032) Avail: NTIS HC A08/MF A01

Advances in science and technology made by the Peoples Republic of China are reported. Topics of discussion include: (1) national developments; (2) physical sciences; (3) applied sciences; (4) life sciences; (5) aerodynamics; (6) chemistry; (7) computers; (8) engineering; (9) mathematics; (10) nuclear physics; (11) physical chemistry; and (12) physics. For individual titles, see N86-12463 through N86-12468.

N86-12463# Joint Publications Research Service, Arlington, Va.
VECTOR VALUED LONG JAMES TYPE BANACH SPACES J(eTA, l sub p)(1 < OR = p < + INFINITY) **c64**
Zhao Junfeng *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-032) 19 Sep. 1985 p 30-39 refs Transl. into ENGLISH from Xitong yu Shuxue (Beijin), v. 5, no. 1, Jan. 1985 p 51-62 (For primary document see N86-12462 03-31)
Avail: NTIS HC A08/MF A01

The concept of the transfinite basis of a Banach space is introduced. The vector valued long James type Banach spaces is investigated. We find that J(eta, L sub p)(1 < or = p < infinity) and its dual J(eta, L sub p)' have the transfinite basis, and if a Banach space X has a transfinite basis, so does the space J(eta, X). G.L.C.

N86-12464# Joint Publications Research Service, Arlington, Va.
FINITE DIFFERENCE SCHEME FOR ONE-DIMENSIONAL MAGNETOHYDRODYNAMIC EQUATIONS **c64**
Liu Deming *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-032) 19 Sep. 1985 p 40-54 refs Transl. into ENGLISH from Shuzhi Jisuan yu Jisuanji Yingyong (Beijing), v. 5, no. 3, Sep. 1984 p 138-150 (For primary document see N86-12462 03-31)
Avail: NTIS HC A08/MF A01

A finite difference scheme for magnetohydrodynamic equations in one dimension is presented. Numeric results have verified its effectiveness. Author

N86-12465# Joint Publications Research Service, Arlington, Va.
CHINA DEVELOPS 6J KrF LASER **c36**
Wang Ganchang, Zhu Xuhui, Wang Naiyan, Xie Jinggang, Li Yinghshan, Zhou Changhual, and Wang Pu *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-032) 19 Sep. 1985 p 62-66 refs Transl. into ENGLISH from He Kexuy yu Gongcheng (Beijing), v. 5, no. 1, Mar. 1985 p 1-5 (For primary document see N86-12462 03-31)
Avail: NTIS HC A08/MF A01

A KrF eximer laser pumped by a relativistic electron beam of high intensity at a gas pressure up to 3.5 atm was investigated. The experiment shows that for an Ar:Kr:F2 = 89.6:10:0.4 mixture, the maximum energy is about 7.2 J and some KrF lines were observed. Author

N86-12466# Joint Publications Research Service, Arlington, Va.
APPLICATION OF RADIOGRAPHIC IMAGE ENHANCEMENT, SEGMENTATION **c74**
Wang Chengye and Xia Wei *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-032) 19 Sep. 1985 p 67-70 Transl. into ENGLISH from Jisuanji Yanjiu yu Fazhan (Beijing), v. 21, no. 12, Dec. 1984 p 52-53 (For primary document see N86-12462 03-31)
Avail: NTIS HC A08/MF A01

A method that enchances GAMMA ray images using a method that smooths partial images with whole information, and that uses the histogram guided convergence method to separate these images is introduced. Author

N86-12467# Joint Publications Research Service, Arlington, Va.
IRON AND STEELMAKING WITH PLASMA **c26**
Yu Dingfu *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-032) 19 Sep. 1985 p 71-84 refs Transl. into ENGLISH from Gangtie (Beijing), v. 20, no. 5, May 1985 p 48-54 (For primary document see N86-12462 03-31)
Avail: NTIS HC A08/MF A01

Plasma iron and steelmaking uses a smelting method that converts the thermal energy in electrical power to gas, and can be called a type of electrometallurgy. For this reason, plasma iron and steelmaking first of all requires consideration of the question of electricity supply capacity and the price of electrical energy. It has attracted a great deal of attention from iron and steel workers in some regions and nations with abundant electric power resources. Research and production work in this area now is unfolding. G.L.C.

N86-12468# Joint Publications Research Service, Arlington, Va.
CAD PROGRAM FOR HIGH-POWER ELECTRON GUN WITH ANNULAR CATHODE DESCRIBED **c33**
Tu Yushan *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-032) 19 Sep. 1985 p 113-117 refs Transl. into ENGLISH from Dianzi Xuebao (Beijing), no. 4, Nov. 1984 p 95-97 (For primary document see N86-12462 03-31)
Avail: NTIS HC A08/MF A01

The characteristics of an electron gun with an annular cathode are described. In order to compare design optimizations for different applications, a program for computer-aided design (CAD) has been compiled and typical examples given. The high-power electron gun with annular cathode can achieve higher compression with a large power density, its beam is adjustable, its static electricity focusing structure is simple, it can avoid mutual contamination of cathodes and bombarded surfaces, etc. Therefore, widespread application is possible in X-ray photoetching, electron-beam smelting and evaporation installation. Author

32 COMMUNICATIONS

Includes land and global communications; communications theory; and optical communications.

For related information see also *04 Aircraft Communications and Navigation* and *17 Spacecraft Communications, Command and Tracking.*

N86-12469 Missouri Univ., Columbia.
DESIGN OF AN ANTENNA FEED SYSTEM TO PRODUCE A UNIFORM FIELD Ph.D. Thesis
Surya Saputra 1984 209 p
Avail: Univ. Microfilms Order No. DA8512241

An analytical approach is presented to find an excitation distribution of a multiple feed horn array radiating to an offset parabolic reflector to produce a uniform field over a region on earth. The reflector antenna is installed in a communication satellite. The aperture field method is used to predict the secondary pattern generated by the reflector antenna. Two antenna synthesis

problems are involved in this discussion, namely the aperture synthesis and the planar array synthesis. The aperture synthesis is formulated into an integral equation. The integral equation is solved for the array factor by applying the Zernike polynomials. Applying the Zernike polynomials, the radiation integral is converted to a Fourier-Bessel series, then the field of the secondary pattern may be expressed as a function of the observation angles. The numerical results show that the shape of the principle beam of the secondary pattern may be classified into three categories which are the convex shape, the concave shape and the shape with some ripples. Dissert. Abstr.

N86-12470 Missouri Univ., Rolla.
HYBRID RADAR WAVEFORM DESIGN UTILIZING COMPLEMENTARY PHASE CODING AND LINEAR FREQUENCY STEPPING FOR ACHIEVING IMPROVED SLANT RANGE RESOLUTION IN A SYNTHETIC APERATURE RADAR Ph.D. Thesis
Daniel Bernard Koch 1984 158 p
Avail: Univ. Microfilms Order No. DA8507615

A hybrid radar waveform design is presented for achieving improved slant range resolution in a synthetic aperture radar system. The hybrid waveform consists of K repetitions of L complementary phase coded pulses with linearly increasing carrier frequency from repetition to repetition. Processing of this frequency stepped, phase coded waveform consists of matched filtering on a pulse-by-pulse basis followed by amplitude weighting and coherent summation. Three types of complementary phase codes are analyzed with coder and decoder structures modeled by finite impulse response digital filters. Computationally efficient decoder structures are identified using the concept of a matched digital filter. The composite ambiguity function is defined and computed for several hybrid waveform examples. Author

N86-12471# Communications Research Centre, Ottawa (Ontario). Radio Progagation Lab.
THE MEASUREMENT OF TROPOSPHERIC REFRACTIVE INDEX RELEVANT TO THE STUDY OF ANOMALOUS MICROWAVE PROPAGATION: REVIEW AND RECOMMENDATIONS
B. Segal Jun. 1985 43 p refs
(CRC-1387) Avail: Issuing Activity

Radio waves propagation between a transmitter and a receiver is determined by the nature of the Earth's surface and by the tropospheric properties. Observations of the refractive index structure in the lower levels of the atmosphere where its impact on radiowave propagation is greatest are summarized. Different meteorological techniques and instrumentation for study the troposphere are reviewed and possible methods for injecting these instruments into the region of interest are discussed. The interactions between the sometimes subtle climatic and emporal changes in the troposphere and the transmission of microwave signals over terrestrial links are examined. It is concluded that a good deal of research and development remains to be done in the area of improved meteorological instrumentation. E.A.K.

N86-12472 Rensselaer Polytechnic Inst., Troy, N. Y.
BANDWIDTH EFFICIENT FREQUENCY-SHIFT KEYED COMMUNICATION SYSTEMS Ph.D. Thesis
Jone-Shyan Sher 1984 345 p
Avail: Univ. Microfilms Order No. DA8509668

The performance of Pulse Code Modulation with Frequency Modulation (PCM/FM) is evaluated. A numerical algorithm is developed to compute the power spectral density function of PCM/FM. By choosing proper baseband signaling pulse and modulation index (h), the waveform of PCM/FR can be made identical to that of MSK, SFSK, and CPFSK. Thus, the spectral property of these modulation schemes can be obtained directly from that of PCM/FM. The spectral efficiency of PCM/fm is evaluated based on the criteria of out-of-band power bandwidth and channel crosstalk bandwidth. Both spectral measures are functions of the modulation index, the baseband signaling pulse, and the shape parameter thereof. For a given bandwidth or channel separation, these two spectral measures might result in different choices of optimum baseband signaling pulses. In general, through, the rectangular pulse results in better spectral performance for very narrow bandwidths, the trapezoidal pulse outperforms for medium bandwidths, and the raised cosine pulse prevails for wider bandwidths. Author

N86-12473 Department of the Air Force, Washington, D.C.
SIMULTANEOUS DETECTION OF TIME COINCIDENT SIGNALS IN AN ADAPTIVE DOPPLER TRACKER Patent
A. W. Roeder, inventor (to Air Force) Issued 23 Apr. 1985 12 p Supersedes AD-D011092; N85-32659
(AD-D011796; US-Patent-4,513,428; US-Patent-Class-375-120) Avail: US Patent and Trademark Office CSCL 17/2

The performance of an adaptive digital Doppler tracker having a sample data phase locked loop is improved by a circuit that detects and demodulates interfering signals. The tracker has a coherence sensor that provides signals indicating coherence and non-coherence conditions. An amplitude sensor generates a strong signal when interfering (time coincident) signals are received. The tracker includes both a coherent data detector and SSB processor. An interference detector receives the outputs of the coherence sensor and the amplitude sensor and generates and SSB enable signal in response to the coincidence of a strong signal and a non-coherent condition signal. The SSB enables the SSB processor which detects both interfering signals. Author (GRA)

N86-12474 Department of the Navy, Washington, D. C.
LOW SIDELOBE, HIGH EFFICIENCY MIRROR ANTENNA WITH TWIST REFLECTOR Patent
D. D. Howard and D. C. Cross, inventors (to Navy) Issued 12 Mar. 1985 4 p Supersedes AD-D009714
(AD-D011835; US-Patent-4,504,835; US-Patent-Appl-SN-389139; US-Patent-Class-343-755) Avail: US Patent and Trademark Office CSCL 09/5

A mirror antenna employing a continuous mirror without a hole. A feed horn and an electromagnetic lens, located behind a rotatable twist reflector (the mirror), collimates a beam toward a polarized reflector located near the twist reflector and tilted to aim energy toward the twist reflector. Energy reflected back toward the polarized reflector from the twist reflector passes through the polarized reflector to free space. Author (GRA)

N86-12475 Department of the Navy, Washington, D. C.
P1 POLYPHASE CODE EXPANDER-COMPRESSOR Patent
F. F. Kretschmer, inventor (to Navy) Issued 23 Apr. 1985 5 p Supersedes AD-D009615
(AD-D011838; US-Patent-4,513,289; US-Patent-Appl-SN-377106; US-Patent-Class-17.2-PC) Avail: US Patent and Trademark Office CSCL 17/9

A pulse expansion and compression system, especially useful for radar ranging, comprising a pulse coder for expanding and input pulse and a pulse compressor of the matched-filter type. The coder consists of a plurality of delay stages into which the input pulse is fed, a discrete Fourier transform (DFT) circuit to which the output signals of the delay stages are fed by way of respective phase weights and for which every other frequency port is inverted prior to entry to a time-dispersion-means (TDM) comprising an arrangement of adders interconnected by delay stages for differently delaying the output signals from the DFT. The TDM output is fed to a phase modulator and then to the transmitter. The echo signals are conjugated, time-inverted, and passed through the same DFT as the input pulse signal by way of the phase weights. The outputs of the DFT are then inverted at every other frequency port and passed through the TDM, but this tme in time-inverted order. The outputs of the TDM are fed through an envelope detector to provide a cross-correlated facsimile of the original input pulse. Author (GRA)

N86-12476 Department of the Navy, Washington, D. C.
P2 POLYPHASE CODE EXPANDER-COMPRESSOR Patent
F. F. Kretschmer, inventor (to Navy) Issued 18 Jun. 1985 5 p Supersedes AD-D009649
(AD-D011839; US-Patent-4,524,363; US-Patent-Appl-SN-377108; US-Patent-Class-343-17.2-PC) Avail: US Patent and Trademark

Office CSCL 17/9

A pulse expansion and compression system, especially useful for radar ranging, comprising a pulse coder for expanding an input pulse and a pulse compressor of the matched-filter type. The coder consists of a plurality of delay stages into which the input pulse is fed, a discrete Fourier transform (DFT) circuit to which the output signals of the delay stages are fed by way of respective phase weights and for which every frequency port is phase-shifted prior to entry to a time-dispersion-means (TDM) comprising an arrangement of delay stages for differently delaying the output signals from the DFT. The TDM output is fed to a phase modulator and then to the transmitter. The echo signals are conjugated, time-inverted, and passed through the same DFT as the input pulse signal by way of the phase weights. The outputs of the DFT are then phase-shifted at every frequency port and passed through the TDM, but this time in time-inverted order. The outputs of the TDM are fed through an envelope detector to provide a cross-correlated facsimile of the original input pulse. Author (GRA)

N86-12477 Department of the Army, Washington, D. C.
COMMUNICATIONS NETWORK STATUS INFORMATION SYSTEM Patent
H. A. Stover, inventor (to Army) Issued 30 Jul. 1985 16 p
(AD-D011850; US-Patent-4,532,625; US-Patent-Appl-SN-542635; US-Patent-Class-370-58) Avail: US Patent and Trademark Office CSCL 17/2

This disclosure concerns a communications network information system, and provides apparatus and a method for efficiently providing survivable communications capability to every surviving node in the communications network from every other surviving node. The types of information provided can include high priority message between users of the communications system, or perhaps of even greater importance, very frequently updated status information about the communications network nodes and their interconnecting links for use in optimally utilizing the surviving resources of a heavily damaged network. With this capability every surviving node in the network will be automatically and efficiently provided with the status of every node and interconnecting link.
Author (GRA)

N86-12478*# Massachusetts Univ., Amherst. Dept. of Electrical and Computer Engineering.
NEAR MILLIMETER WAVE IMAGING/MULTI-BEAM INTEGRATED ANTENNAS Technical Report, 1 Apr. - 30 Sep. 1985
K. Sigfrid Yngvesson and Daniel H. Schaubert 30 Sep. 1985 134 p refs
(Grant NAG1-279)
(NASA-CR-176332; NAS 1.26:176332) Avail: NTIS HC A07/MF A01 CSCL 20N

This report describes the most recent work on the theory of single element Linearly Tapered Slot Antennas (LTSAs) and Constant Width Slot Antennas (CWSAs). The radiation mechanism for these is presently well understood and allows quantitative calculation of beamwidths and sidelobe levels, provided that the antennas have a sufficiently wide conducting region on either side of the tapered slot. Appendices 4 to 7 represent earlier work on the grant. This work further elucidates the properties of arrays of CWSA elements, and the effects of coupling on the beam-shape. It should be noted that typical beam-efficiencies of 65% have been estimated, and that element spacings of about one Rayleigh unit are possible. Further, two-point resolution at the Rayleigh spacing has been demonstrated for a CWSA array in a 30.4 cm paraboloid at 31 GHz. These results underscore that interest in further studies of the radiation mechanism of tapered slot arrays. Appendix 7 constitutes a final, detailed report on the work leading to a 94 GHz seven element LTSA array imaging system, which has been reported previously in less detail. Experimental results are presented. For individual titles, see N86-12479 through N86-12483.

N86-12479*# Massachusetts Univ., Amherst.
ADDITIONAL RESULTS ON THE RADIATING PROPERTIES OF LTSAS AND CWSAS
In its Near Millimeter Wave Imaging/Multi-Beam Integrated Antennas 30 Sep. 1985 64 p refs (For primary document see N86-12478 03-32)
Avail: NTIS HC A07/MF A01 CSCL 20N

Results are presented on the theoretical experimental investigations of the radiating properties of Linearly Tapered Slot Antennas (LTSAs) and Constant Width Slot Antennas (CWSAs). The antenna is treated as a flared slot radiating in the presence of a conducting half plane. The aperture distribution in the flared slot is determined by approximating the tapered structure as a series of short sections of parallel slots. The slot field of a uniform slotline is determined by employing the spectral Galerkin's technique and a power conservation criterion is employed to match the fields at the step junction between two successive sections. Comparison is made between theory and experiment for several LTSAs and CWSAs etched on epsilon sub r = 2.22 and 2.55 substrates, and or flare angles 4 deg < or = gamma < or = 10 deg. It is shown that the theory adequately models the physics of the problem when the lateral dimension D of the antenna is large and when the propagation constant of a parallel slot line can be estimated very accurately. Newly observed effects of the lateral truncation on the radiation pattern of the antenna are discussed. B.W.

N86-12480*# Massachusetts Univ., Amherst. Dept. of Electrical and Computer Engineering.
CHARACTERISTIC IMPEDANCE OF A WIDE SLOT LINE ON LOW PERMITTIVITY SUBSTRATES
R. Janaswamy and D. H. Schaubert *In its* Near Millimeter Wave Imaging/Multi-Beam Integrated Antennas 30 Sep. 1985 12 p refs Submitted for publication (For primary document see N86-12478 03-32)
(Grant NAG1-279)
Avail: NTIS HC A07/MF A01 CSCL 20N

Computed results on the characteristic impedance of wide slots etched on an electrically thin substrate of low dielectric constant epsilon sub r are presented. Results are given for epsilon sub r = 2.22, 3.0, 3.8 and 9.8. Comparison is shown for the characteristic impedance between the present calculations and those available in the literature for high-epsilon sub r substrates. Author

N86-12481*# Massachusetts Univ., Amherst. Dept. of Electrical and Computer Engineering.
ANALYSIS OF THE TEM MODE LINEARLY TAPERED SLOT ANTENNA
Ramakrishna Janaswamy, Daniel H. Schaubert, and David M. Pozar *In its* Near Millimeter Wave Imaging/Multi-Beam Integrated Antennas 30 Sep. 1985 34 p refs Submitted for publication (For primary document see N86-12478 03-32)
(Grant NAG1-279)
Avail: NTIS HC A07/MF A01 CSCL 20N

The theoretical analysis of the radiation characteristics of the TEM mode Linearly Tapered Slot Antenna (LTSA) is presented. The theory presented is valid for antennas with air dielectric and forms the basis for analysis of the more popular dielectric-supported antennas. The method of analysis involves two steps. In the first step, the aperture distribution in the flared slot is determined. In the second step, the equivalent magnetic current in the slot is treated as radiating in the presence of a conducting half-plane and the far-field components are obtained. Detailed comparison with experiment is made and excellent agreement is obtained. Design curves for the variation of the 3 dB and 10 dB beamwidths as a function of the antenna length, with the flare angle as a parameter, are presented. Author

N86-12482*# Onsala Space Observatory (Sweden).
MODEL EXPERIMENTS WITH SLOT ANTENNA ARRAYS FOR IMAGING
J. F. Johansson, K. S. Yngvesson (Massachusetts Univ., Amherst), and E. L. Kollberg *In* Massachusetts Univ. Near Millimeter Wave Imaging/Multi-Beam Integrated Antenna 30 Sep. 1985 9 p refs Prepared for presentation at the 10th Intern. Conf. on Infrared and Millimeter Waves, Orlando, Fla., Dec. 1985 (For primary document see N86-12478 03-32)

Avail: NTIS HC A07/MF A01 CSCL 20N

A prototype imaging system at 31 GHz was developed, which employs a two-dimensional (5x5) array of tapered slot antennas, and integrated detector or mixer elements, in the focal plane of a prime-focus paraboloid reflector, with an f/D=1. The system can be scaled to shorter millimeter waves and submillimeter waves. The array spacing corresponds to a beam spacing of approximately one Rayleigh distance and a two-point resolution experiment showed that two point-sources at the Rayleigh distance are well resolved. Author

N86-12483*# Massachusetts Univ., Amherst. Dept. of Electrical and Computer Engineering.

A NEW INTEGRATED SLOT ELEMENT FEED ARRAY FOR MULTI-BEAM SYSTEMS

K. Sigfrid Yngvesson, J. F. Johansson, and Erik L. Kollberg *In its* Near Millimeter Wave Imaging/Multi-Beam Integrated Antennas 30 Sep. 1985 12 p refs Prepared for presentation at the SPIE Conf. on Submillimeter Spectry., Cannes, Frances, 5-6 Dec. 1985 Prepared in cooperation with Onsala Space Observatory (Sweden) (For primary document see N86-12478 03-32)

Avail: NTIS HC A07/MF A01 CSCL 20N

A feed array consisting of constant width slot antennas (CWSA's), fed from a block containing fin-line transitions, has been developed. The array has a two-dimensional configuration, with five elements each on five parallel substrates. Beam-widths are compatible with use in f/D-1.0 multi-beam systems, with optimum taper. Array element spacings are close to a factor of two smaller than for other typical arrays, and spill-over efficiency is about 65%. Author

N86-12484*# Massachusetts Univ., Amherst. Dept. of Electrical and Computer Engineering.

A 94 GHz IMAGING ARRAY USING SLOT LINE RADIATORS Ph.D. Thesis

Thomas Leo Korzeniowski Sep. 1985 142 p refs

(Grant NAG1-279)

(NASA-CR-176348; NAS 1.26:176348) Avail: NTIS HC A07/MF A01 CSCL 20N

A planar endfire slotted-line antenna structure was investigated. It was found that the H-plane beamwidths are basically dependent upon the substrate properties, whereas the E-plane beamwidths are more strongly a function of the slot's shape and size. It is shown that these antennas produce symmetrical E and H-plane beamwidths while following Zucker's standard traveling-wave antenna beamwidth curves over some range of antenna normalized length. An empircally derived design formula for effective substrate thickness is shown to predict this range for linearly tapered slotted-line antennas. The experimental imaging properties of these arrays are presented and imaging theory is discussed. It is shown that a minimum spacing of elements is necessary for exact reconstruction for a sampled image in a diffraction limited system. Because these LTSA elements employ the traveling-wave mechanism of radiation, they can be spaced two times closer than a conical feed horn of comparable beamwidth. E.A.K.

N86-12485*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

STRATEGY FOR REFLECTOR PATTERN CALCULATION: LET THE COMPUTER DO THE WORK

P. T. Lam (Illinois Univ., Urbana), S. W. Lee (Illinois Univ., Urbana), C. C. Hung (Lockheed Missiles and Space Co., Sunnyvale, Calif.), and R. Acousta Oct. 1985 9 p refs

(Grant NAG3-149)

(NASA-TM-87137; E-2755; NAS 1.15:87137) Avail: NTIS HC A02/MF A01 CSCL 20N

Using high frequency approximations, the secondary pattern of a reflector antenna can be calculated by numerically evaluating a radiation integral I(u,v). In recent years, tremendous effort has been expended to reducing I(u,v) to Fourier integrals. These reduction schemes are invariably reflector geometry dependent. Hence, different analyses/computer software development must be carried out for different reflector shapes/boundaries. it is pointed out, that, as the computer power improves, these reduction schemes are no longer necessary. Comparable accuracy and computation time can be achieved by evaluating I(u,v) by a brute force FFT described in this note. Furthermore, there is virtually no restriction on the reflector geometry by using the brute force FFT. Author

N86-12486 British Broadcasting Corp., Kingswood (England). Engineering Div.

ROOM MODES AND SOUND ABSORPTION: SOME PRACTICAL MEASUREMENTS COMPARED WITH THEORETICAL PREDICTIONS

E. W. Taylor and C. Eng Aug. 1985 29 p refs

(BBC-RD-1985/11) Avail: Issuing Activity

Changes in the amount of sound absorption, which occur when absorbing material is placed at different regions of a standing wave pattern in a reverberant enclosure, are discussed. Theoretical predictions of this change of absorption are compared with practical measurements. The dependence of the degree of excitation of the absorbing surface on the standing wave pattern over its area, the relative importance of the potential and kinetic energy components in the sound field, and the acceptance of energy from regions of the sound field not immediately adjacent to the absorber, are cited as causes of the observed differences between the theoretical and practical results. E.A.K.

N86-12487# Naval Postgraduate School, Monterey, Calif.

COMPARISON OF CONTINUOUS SPEECH, DISCRETE SPEECH, AND KEYBOARD INPUT TO AN INTERACTIVE WARFARE SIMULATION IN VARIOUS C3 ENVIRONMENTS M.S. Thesis

R. B. Manson and M. E. Wright Mar. 1985 122 p

(AD-A156830; AD-E301723) Avail: NTIS HC A06/MF A01 CSCL 17/2

This thesis describes an experiment conducted at the Naval Postgraduate School during the period 30 October 1984 through 30 November 1984. Specifically, the experiment compares the use of continuous speech recognition equipment, discrete speech recognition equipment, and keyboard to input commands in a command and control environment. This was accomplished by using the Naval Warfare Interactive Simulation System (NWISS) as a vehicle to pose military problems to subject in a variety of light and noise environments. Although the results are not conclusive, they do show a definite advantage in using continuous speech or keyboard entry modes over discrete speech modes. Continuous speech and keyboard methods were superior in all environmental conditions. Author (GRA)

N86-12488# Naval Postgraduate School, Monterey, Calif.

AN EVOLVING DIGITAL TELECOMMUNICATIONS INDUSTRY AND ITS IMPACT ON THE OPERATIONAL ENVIRONMENT OF THE NATIONWIDE EMERGENCY TELECOMMUNICATION SYSTEM (NETS) M.S. Thesis

R. J. Stahel Mar. 1985 101 p

(AD-A156831; AD-E301723) Avail: NTIS HC A06/MF A01 CSCL 17/2

Following a national disaster, a Nationwide Emergency Telecommunications System (NETS) would be created by combining the existing telecommunications capabilities of government, public carriers and private networks. This thesis addressed an evolving digital capabilities, reviews the digital telecommunications industry and analyzes the impact of a changing digital technology upon the desired features of a pre-emergency network. GRA

N86-12489# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.

INTERNETTING AND PACKET SATELLITE PROGRAM Final Report

S. Blumenthal Jul. 1985 23 p

(Contract MDA903-80-C-0353)

(AD-A157124; BBN-5939) Avail: NTIS HC A02/MF A01 CSCL 17/2

As a means of utilizing valuable communications resources more efficiently, The Department of Defense Advanced Research Projects AGency has sponsored a program of research and

development in the area of packet-switched data networks. In addition to more efficient utilization, packet switching systems with autonomous distributed control can be made robust and survivable. In support of this program, BBN has conducted research and development in the areas of Internetting and the efficient use of broadcast satellite channels by packet-switched networks. Specific work performed under this contract involved the development of Internet gateways to interconnect many different types of dissimilar packet-switched networks, Internet protocols for data communication, and a Terminal Access Controller utilizing these protocols for remote network-access to time-shared computer systems. BBN also continued the development of the Atlantic Packet Satellite Network, (SATNET) providing Internet connectivity between sites in the U.S. and Europe using a shared 64kb/s INTELSAT satellite channel, and the domestic Wideband Packet Satellite Network, providing high bandwidth communication among ten sites within the continental U.S. GRA

N86-12490# Canadian Scientific Liason Office, Washington, D.C.
ELIE: SAINT EUSTACHE FIBRE OPTIC FIELD TRIAL PROJECT EVALUATION REPORT, VOLUME 4
K. B. Harris, G. A. Tough, and M. B. Akgun Mar. 1985 429 p 2 Vol.
(AD-A157144) Avail: NTIS HC A19/MF A01 CSCL 17/2

The Elie - St. Eustache Fibre Optic Field Trial has provided voice, data and video communications through an integrated services access system to 150 residential and small business participants in a rural area. The trial has generated a wealth of information in all stages of the project such as design, implementation and operation. The uniqueness of the system makes it worthwhile to document in detail all the experience gained for use by national and international parties who have an interest in the design, manufacture and operation of similar systems in the future. GRA

N86-12491# Rio Grande Associates, Houston, Tex.
NONLINEAR ELECTROMAGNETIC SCATTERING FROM A DIODE CIRCUIT
R. R. Beland Jan. 1984 40 p
(Contract F19628-81-C-0128)
(AD-A157216; AFGL-TR-84-0151; SR-3) Avail: NTIS HC A03/MF A01 CSCL 20/14

Electromagnetic scattering from an active diode circuit is considered. The focus is on the nonlinear interaction between the incident fields and the internal circuit sources. This interaction results in a mixing of frequencies between the incident and internal sources. An equivalent circuit model of the diode circuit and dipole antenna is presented and a nonlinear differential equation derived. This equation is solved approximately by a Volterra series to third order. This solution is simulated and numerical values of total scattered power at the various frequencies are calculated. GRA

N86-12492# Naval Research Lab., Washington, D. C.
RENORMALIZATION OF AN INVERSE SCATTERING THEORY FOR INHOMOGENEOUS DIELECTRICS
H. D. Ladouceur and A. K. Jordan 19 Jul. 1985 14 p
(RR0-3302)
(AD-A157224; NRL-MR-5605) Avail: NTIS HC A02/MF A01 CSCL 20/14

Renormalized solutions are obtained for an inverse scattering problem that are equivalent to the second-order regular perturbation approximations for the exact (Gelfand-Levitan-Marchenko) theory. We have developed an inversion method for reconstructing the permittivity profiles of inhomogeneous dielectric slabs from reflection coefficient data. Solutions with increased radii of convergence are obtained. Numerical examples are demonstrated for simulated scattering data from Gaussian and parabolic profiles and homogeneous slabs. GRA

N86-12493# Southeastern Center for Electrical Engineering Education, Inc., St. Cloud, Fla.
BASIC EMC (ELECTROMAGNETIC COMPATIBILITY) TECHNOLOGY ADVANCEMENT FOR C3 (COMMAND, CONTROL, AND COMMUNICATIONS) SYSTEMS. VOLUME 6 Final Technical Report, Jun. 1982 - Dec. 1983
D. Weiner, C. R. Paul, and J. Whalen Apr. 1985 140 p
(Contract F30602-81-C-0062)
(AD-A157239; RADC-TR-82-286-Vol-6) Avail: NTIS HC A07/MF A01 CSCL 17/2

This research effort was devoted to eliminating some of the basic technological gaps in the two important areas of: (1) electromagnetic effects (EM) on microelectronic circuits and (2) EM coupling and testing. The results are presented in fourteen reports which have been organized into six volumes. The reports are briefly summarized in this volume. In addition, an experiment is described which was performed to demonstrate the feasibility of applying several of the results to a problem involving electromagnetic interference. Specifically, experimental results are provided for the randomness associated with: (1) crosstalk in cable harnesses and (2) demodulation of amplitude modulated (AM) signals in operational amplifiers. These results are combined to predict candidate probability density functions (pdf's) for the amplitude of an AM interfering signal required to turn on a light emitting diode. The candidate pdf's are shown to be statistically consistent with measured data. Author (GRA)

N86-12494# Adaptive Sensors, Inc., Santa Monica, Calif.
ANALYSIS OF CONSTANT FALSE ALARM RATE SIDELOBE CANCELLER CRITERION Final Progress Report
I. S. Reed and L. E. Brennan May 1985 24 p
(Contract N00019-84-C-0074)
(AD-A157412) Avail: NTIS HC A02/MF A01 CSCL 17/4

In this final report, the constant false alarm rate (CFAR) detection criterion for a sidelobe canceller (SLC) system, introduced in the last quarterly progress report, is found completely and analyzed. This new detection test for radar exhibits the desirable CFAR property that its probability of a false alarm (PFA) is functionally independent of the covariance of the actual noise field encountered. As a consequence, such a CFAR SLC system is ideally suited to cope with the newly evolving smart jammer threat to radar. An important objective, set in the last quarterly progress report, was to find both the false alarm and signal detection probabilities of this test. The first and most important of these two goals has been met. The probability of a false alarm (or PFA) of this CFAR SLC detection criterion is derived in closed form in this report. The success in finding the PFA is due primarily to the use of a generalization of Cochran's theorem. GRA

N86-12495# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
RADIO-ABSORBING MATERIALS
Y. A. Shneyderman 16 Jul. 1985 64 p Transl. into ENGLISH from Zarubezhneya Radioelektron. (USSR), no. 4, 1965 p 115-135
(AD-A157496; FTD-ID(RS)T-1326-84) Avail: NTIS HC A04/MF A01 CSCL 17/4

Recently abroad in connection with rapid development of radar technology methods and means of antiradar protection of flight vehicles, which facilitate breach/inrush of aircraft and rockets through lines of air defense intensively are developed/processed. On the intensification of works in this direction it is possible to judge a sharp increase in the expenditures of USAF (United States Air Force) for the development of the combat means with radar - with 35.5 million dollars in 1962 to 119 million dollars in 1963 and 155 million dollars each in 1964. Utilization of radio-absorbing materials, which ensure decrease of effective surface of scattering of aircraft and rockets, is one of effective combat means with radar. GRA

N86-12496# Rome Air Development Center, Griffiss AFB, N.Y.
SCATTERING EXPERIMENTS AT THE IPSWICH ELECTROMAGNETIC MEASUREMENTS FACILITY: BACKSCATTER FROM METAL CUBES Report, for Jan. - Dec. 1984
R. V. McGahan Feb. 1985 18 p
(AF Proj. 2305)
(AD-A157925; RADC-TR-85-24) Avail: NTIS HC A02/MF A01

CSCL 20/14

Backscatter cross section measurements at broadside incidence were made on eighteen metal cubes at X-band. The measurements are compared with theoretical predictions made using Enhanced High Frequency Diffraction and Augmented Magnetic field Integral Equation solutions. A composite solution is formed and compared with the measurements, providing a validated backscatter solution for metal cubes from arbitrarily low to arbitrarily high frequencies. GRA

N86-12497# University of Southern California, Los Angeles. Communication Sciences Inst.

ADVANCED DIGITAL COMMUNICATION RESEARCH Final Report, 1 Sep. 1982 - 31 May 1985

R. A. Scholtz and L. M. Silverman Jul. 1985 59 p

(Contract DAAG29-82-K-0142)

(AD-A158412; CSI-85-07-04; ARO-19147.37-EL) Avail: NTIS HC A04/MF A01 CSCL 17/2

The research proposed for this contract included the following topics: spread-spectrum systems (synch acquisition and performance), the design of pseudorandom sequences, digital signal design, spectral shaping via redundancy, retrodirective array processing, VLSI implementation of number-theoretic transforms, and approximation theory. GRA

N86-12498# Brookhaven National Lab., Upton, N. Y.

HIGH ORDER MODE DAMPING IN THE NSLS ACCELERATING RF CAVITIES BY THE USE OF DAMPING ANTENNAE

N. Fewell and Z. Wen 1985 4 p refs Presented at the Particle Accelerator Conf., Vancouver, British Columbia, 13 May 1985

(Contract DE-AC02-76CH-00016)

(DE85-014214; BNL-36506; CONF-850504-195) Avail: NTIS HC A02/MF A01

High order modes were successfully damped in the existing NSLS accelerating cavities by the insertion of damping antennae. The location of the antennae was aided by cavity field plots using superfish and their lengths determined experimentally. A description of their construction is presented together with the results of their insertion upon higher order cavity modes and beam stability. E.A.K.

N86-12499# Argonne National Lab., Ill.

MICROWAVE RIDGED WAVEGUIDE BEAM PICKUPS

D. Suddeth 1985 3 p Presented at the Particle Accelerator Conf., Vancouver, British Columbia, 13 May 1985

(Contract W-31-109-eng-38)

(DE85-013816; ANL-HEP-CP-85-41; CONF-850504-180) Avail: NTIS HC A02/MF A01

Sensitive broadband beam pickups are a prerequisite for improved stochastic beam cooling. The 2 to 4 GHz and the 4 to 8 GHz bands were of particular interest for stochastic cooling applications. This report summarizes the striking results of an investigation of ridged waveguide pickups at Argonne. An upper to lower frequency ratio of 2.4:1 is readily obtained with a ridged waveguide as compared to 1.5:1 with a standard waveguide. Wire measurements and tests at the Argonne beam test facility indicate an approximate 20% increase in gain per unit over a stripline with comparable longitudinal spacing. Another advantage of waveguide pickups is construction simplicity. The output is easily coupled to a transmission line. Descriptions of the design, construction, and results are reported. DOE

N86-12500# Sandia National Labs., Albuquerque, N. Mex.

RESULTS OF FIELD AND LABORATORY STUDIES OF JAM-RESISTANT AND VOICE-PRIVATE RADIOS

J. E. Heustess, M. K. Snell, and D. J. Gangel 1985 7 p Presented at the 26th Ann. Meeting of the Inst. of Nucl. Mater. Management, Albuquerque, N. Mex., 21 Jul. 1985

(Contract DE-AC04-76DP-00789)

(DE85-014841; SAND-85-1570C; CONF-850765-5) Avail: NTIS HC A02/MF A01

Radio communications systems that use voice privacy or voice scrambling exhibit varying degrees of security range reduction, message intelligibility, and susceptibilities to a jamming assault. Studies included the evaluation of Data Encryption Standard (DES) and Frequency Hopping (FH) systems. Results include voice intelligibility, jamming survivability, and range reduction percentages. DOE

N86-12501# National Telecommunications and Information Administration, Boulder, Colo. Inst. for Telecommunication Sciences.

SPECTRUM RESOURCE ASSESSMENT OF THE 1605-2000 kHz BAND

R. E. Thompson, W. B. Grant, and J. C. Carroll Apr. 1985 119 p

(PB85-225076; NTIA-85-175) Avail: NTIS HC A06/MF A01 CSCL 17B

The report is a spectrum resource assessment of the 1605 to 2000 kHz band. It includes information on rules, regulations, allocations, technical standards, frequency assignments, system characteristics, and applicable compatibility analyses pertinent to the 1605 to 2000 kHz band. Major issues are discussed concerning changes in the allocation tables due to WARC-79 decisions. Parts of the 1605 to 2000 kHz band are in transition from radiolocation service use to broadcasting service use. Major problems in this band are the sharing among travelers' information stations, radiolocation, and broadcasting and the proliferation of the cordless telephone. The report analyzes the possibility of sharing between broadcasting and travelers' information stations and radiolocation, along with addressing the problems associated with cordless telephones. GRA

N86-12502# National Telecommunications and Information Administration, Annapolis, Md.

HANDBOOK OF RADIO WAVE PROPAGATION LOSS (100-10,000 MHz)

W. E. Frazier Dec. 1984 172 p refs

(PB85-200012; NTIA-84-165) Avail: NTIS HC A08/MF A01 CSCL 20N

This handbook is intended to assist in manual analysis techniques that must be used when an automated analysis is not possible. It provides estimates of radio wave propagation loss between transmitting and receiving antennas above the assumed smooth-earth surface that were calculated using the Integrated Propagation System (IPS) computer model. For many cases involving electromagnetic compatibility analysis, the included curves of transmission loss predictions may be used for estimating transmission loss for the desired signal and the undesired signal. These loss values are given in dB as BASIC MEDIAN TRANSMISSION LOSS for antennas with effective heights up to 5000 meters, operating in the 100 to 10,000 MHz frequency range, over land or sea, at great circle earth surface distances up to 1,000 kilometers. GRA

N86-12376# Tokyo Denki Univ. (Japan). Faculty of Engineering.

EXTRACTION OF FEATURE PARAMETERS FOR SPOKEN WORD RECOGNITION

T. Tanaka and S. Nakamura *In its* Res. Rept. of the Faculty of Eng., Tokyo Denki Univ., No. 32 Dec. 1984 p 57-65 refs In JAPANESE; ENGLISH summary (For primary document see N86-12372 03-31)

Avail: NTIS HC A09/MF A01

N86-12378# Tokyo Denki Univ. (Japan). Faculty of Engineering.

A PHYSICAL METHOD FOR ESTIMATING SPEECH INTELLIGIBILITY IN A REVERBERANT SOUND FIELD

Yasuo Ogura *In its* Res. Rept. of the Faculty of Eng., Tokyo Denki Univ., No. 32 Dec. 1984 p 79-100 refs In JAPANESE; ENGLISH summary (For primary document see N86-12372 03-31)

Avail: NTIS HC A09/MF A01

N86-12379# Tokyo Denki Univ. (Japan). Faculty of Engineering.

DUMMY HEAD MICROPHONE AND ITS APPLICATION TO THE MEASUREMENTS OF ELECTRO-ACOUSTIC EQUIPMENTS
In its Res. Rept. of the Faculty of Eng., Tokyo Denki Univ., No. 32 Dec. 1984 p 101-115 refs In JAPANESE; ENGLISH summary (For primary document see N86-12372 03-31)
Avail: NTIS HC A09/MF A01

N86-12424# Joint Publications Research Service, Arlington, Va.
PULSED RADIATION DETECTION TECHNOLOGY DISCUSSED
Lu Min *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-021) 8 Jul. 1985 p 99-112 Transl. into ENGLISH from Hedianzixue Yu Tance Jishu (Beijing), v. 4, no. 6, Nov. 1984 p 321-328 (For primary document see N86-12421 03-31)
Avail: NTIS HC A09/MF A01

N86-12432# Joint Publications Research Service, Arlington, Va.
OPTIC FIBER APPLICATIONS IN DATA COMMUNICATIONS
Yu Huaiquan and Lu Zinan *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-034) 1 Oct. 1985 p 53-58 Transl. into ENGLISH from Dianzi Jishu (Shanghai), v. 12, no. 5, 20 May 1985 p 15-17; 19 (For primary document see N86-12430 03-31)
Avail: NTIS HC A08/MF A01

N86-12452# Joint Publications Research Service, Arlington, Va.
COMPUTER-AIDED ANALYSIS OF ARBITRARY-SHAPED THIN-WIRE ANTENNAS
Hong Wei and Zhang Wenxun *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-030) 4 Sep. 1985 p 15-23 refs Transl. into ENGLISH from Nanjing Gongxueyuan Xuebao (Nanjing), no. 4, 20 Dec. 1984 p 61-67 (For primary document see N86-12451 03-31)
Avail: NTIS HC A08/MF A01

N86-12644# Joint Publications Research Service, Arlington, Va.
INFLUENCE OF SHORT GRAVITY WAVES ON THERMAL RADIO EMISSION OF WATER SURFACE Abstract Only
V. A. Ilin, A. A. Naumov, V. Yu. Rayzer, S. R. Filonovich, and V. S. Etkin *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 15 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atm. i Okeana (Moscow), v. 21, no. 1, Jan. 1985 p 83-89 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

N86-12648# Joint Publications Research Service, Arlington, Va.
CORRELATION CHARACTERISTICS OF SIGNALS REFLECTED BY THE WAVY SURFACE OF OCEAN IN MIRROR DIRECTION Abstract Only
Yu. Yu. Zhitkovskiy, A. V. Nosov, and V. V. Savelyev *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 18 Transl. into ENGLISH from Akust. Zh. (Moscow), v. 30, no. 6, Nov. - Dec. 1984 p 772-776 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

N86-12684# Joint Publications Research Service, Arlington, Va.
METHOD FOR SOLVING PROBLEMS IN ELECTRODYNAMICS OF ANISOTROPIC MEDIA WITH SLANT BEDDING Abstract Only
M. G. Savin *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 59-60 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Zemli (Moscow), no. 2, Feb. 1985 p 75-82 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

N86-12701# Joint Publications Research Service, Arlington, Va.
PHASE OPERATOR METHOD IN PROBLEM OF SCATTERING OF ELECTROMAGNETIC WAVES ON IDEALLY CONDUCTING SURFACE Abstract Only
A. G. Voronovich *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-008) 16 Aug. 1985 p 7-8 Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 282, no. 2, May 1985 p 286-290 (For primary document see N86-12697 03-42)
Avail: NTIS HC A04/MF A01

33 ELECTRONICS AND ELECTRICAL ENGINEERING

Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry.

For related information see also *60 Computer Operations and Hardware* and *76 Solid-State Physics.*

N86-12503 Pittsburgh Univ., Pa.
ADAPTIVE KALMAN FILTERING WITH CONTROL INPUT ESTIMATION Ph.D. Thesis
Chih-Tsong Chen 1984 103 p
Avail: Univ. Microfilms Order No. DA8512551

The application of Kalman filter to a linear stochastic system requires complete information regarding the system's dynamics and observations. A major disadvantage of the Kalman filter is that it is sensitive to erroneous modeling of the system. In practice there are problems associated with unknown control inputs. In this case the solution provided by the Kalman filter is suboptimal. One way to improve the filter's performance is to estimate the unknown control inputs. The estimate is then fed back to the Kalman filter to improve its behavior. When the estimated control inputs are sent back to the Kalman filter, their estimation errors also have the tendency to increase the filter's estimation uncertainty, which, in turn, will further degrade the system's performance. By manipulating the system's observability matrix, one is able to present a new algorithm in which the degraded state estimate generated by the Kalman filter is not involved in the estimation of the unknown control inputs, so that the accumulation of the estimation errors does not have any chance to take place in our adaptive estimation system. Dissert. Abstr.

N86-12504 Michigan State Univ., East Lansing.
INTEGRAL EQUATION DESCRIPTION OF INTEGRATED DIELECTRIC WAVEGUIDES Ph.D. Thesis
Jonathan Scott Bagby 1984 205 p
Avail: Univ. Microfilms Order No. DA8507475

An equivalent polarization integral equation is advanced for use in the analysis of integrated dielectric waveguiding systems. This inhomogeneous Fredholm equation of the second kind in the unknown total waveguide core electric field provides a conceptually exact formulation of the guidance properties of a wide class of practical integrated dielectric waveguides. The integral equation is applied to a generalized axially uniform integrated dielectric waveguiding system. This axial uniformity renders the axial integral convolutional in nature, prompting the use of a spatial Fourier transform. This results in an inhomogeneous Fredholm equation for the unknown transformed total core field. Subsequent inversion of the transformed field with the aid of the residue theorem allows identification of two components of the total core field: the surface waves of the guide and the radiation spectrum. Application of moment method and Neumann series techniques to the integral equation is discussed. Author

N86-12505 Case Western Reserve Univ., Cleveland, Ohio.
DESIGN OF HIGH POWER SUPERCONDUCTING SWITCHES Ph.D. Thesis
Maher Elyon Rizkalla 1985 98 p
Avail: Univ. Microfilms Order No. DA8510104

Repetitive opening switches capable of handling 5000 Amps and holdoff voltage >10 kV operating in a very short time (approx. 1 micro sec) were designed. The maximum change of temperature during the effective time of the heat source and the cooling rate of the superconducting material were calculated. Different materials were examined in order to determine the most suitable materials to optimize acoustic matching for different interfaces. The problem of heat transfer was simulated numerically in order to establish the temperature distribution across the switch. The computer results for the different materials were used in order to determine the maximum operating conduction current that can be applied on

these switches while they are operating in the free convection regime of liquid helium. Dissert. Abstr.

N86-12506 Department of the Air Force, Washington, D.C.
VARIABLE RADIUS LEAD FORMER Patent
R. L. Zahn, inventor (to Air Force) Issued 7 May 1985 5 p Supersedes AD-D010867
(AD-D011790; US-Patent-4,515,001; US-Patent-Appl-SN-566352; US-Patent-Class-72-323) Avail: US Patent and Trademark Office CSCL 13/8

A variable radius lead former operates an axial lead electronic component wherein the bend radius may be adjusted to any desired radius within specifications. Author (GRA)

N86-12507 Department of the Navy, Washington, D. C.
DEMOUNTABLE COAXIAL ELECTRICAL CONNECTOR FOR IN-LINE AMPLIFIERS Patent
R. J. Phillips, inventor (to Navy) Issued 25 Jun. 1985 4 p Supersedes AD-D011074
(AD-D011831; US-Patent-4,525,013; US-Patent-Appl-SN-571414; US-Patent-Class-339-7) Avail: US Patent and Trademark Office CSCL 09/1

A flexible coaxial connector assembly is used on buoyant cable antenna systems. It comprises a retainer assembly that has threads mating with a bellows assembly. Components that mate in a flexible manner are enclosed by the bellows. An electrical wire passes through these flexible mating components and terminates in a contact pin. The contact pin mates with an amplifier contact socket assembly. GRA

N86-12508*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
THE ROLE OF AMPLITUDE-TO-PHASE CONVERSION IN THE GENERATION OF OSCILLATOR FLICKER PHASE NOISE
Chase P. Hearn Oct. 1985 12 p refs
(NASA-TM-87590; L-16015; NAS 1.15:87590) Avail: NTIS HC A02/MF A01 CSCL 09C

The role of amplitude-to-phase conversion as a factor in feedback oscillator flicker phase noise is examined. A limiting stage consisting of parallel-connected opposite polarity diodes operating in a circuit environment contining reactance is shown to exhibit amplitude-to-phase conversion. This mechanism coupled with resistive upconversion provides an indirect route for very low frequency flicker noise to be transferred into the phase of an oscillator signal. It is concluded that this effect is more significant in the lower frequency regimes where the onlinear reactances associated with active devices are overwhelmed by linear reactive elements. Author

N86-12509*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
PERFORMANCE AND TEMPERATURE DEPENDENCIES OF PROTON IRRADIATED n/p GaAs AND n/p SILICON CELLS
I. Weinberg, C. K. Swartz, and R. E. Hart, Jr. 1985 10 p refs Presented at the 18th Photovoltaic Specialists Conf., Las Vegas, Nev., 21-25 Oct. 1985; sponsored by IEEE
(NASA-TM-87136; E-2753; NAS 1.15:87136) Avail: NTIS HC A02/MF A01 CSCL 09C

The n/p homojunction GaAs cell is found to be more radiation resistant than p/nheteroface GaAs under 10 MeV proton irradiation. Both GaAs cell types outperform conventional silicon n/p cells under the same conditions. An increase temperature dependency of maximum power for the GaAs n/p cells is attributed largely to differences in Voc between the two GaAs cell types. These results and diffusion length considerations are consistent with the conclusion that p-type GaAs is more radiation resistant than n-type and therefore that the n/p configuration is possibly favored for use in the space radiation environment. However, it is concluded that additional work is required in order to choose between the two GaAs cell configurations. Author

N86-12510# North Carolina State Univ., Raleigh. Dept. of Electrical and Computer Engineering.
HIGH FREQUENCY SILICON BIPOLAR TRANSISTOR WITH SIPOS (SEMI-INSULATING POLYCRYSTALLINE SILICON) HETEROJUNCTION EMITTER AND ION IMPLANTED RAPID THERMAL ANNEALED BASE REGION Annual Report
J. J. Wortman, J. R. Hauser, M. A. Littlejohn, G. A. Rozgonyi, and V. H. Ozguz Mar. 1985 142 p
(Contract N00014-82-K-0468)
(AD-A157141) Avail: NTIS HC A07/MF A01 CSCL 09/1

The research program described in this report is directed toward the investigation of concepts for improved high-frequency, high-speed, silicon bipolar transistors. The research is focused in three major areas: (1) deposition and characterization of semi-insulating polycrystalline silicon (SIPOS) as a heterojunction emitter. (2) use of ion implantation and rapid thermal annealing (RTA) for forming the base of bipolar transistors, (3) investigation of other technologies such as oxide isolation and polycrystalline silicon contacts to reduce parasitic effects to improve limitations at high frequencies. The research ranges from fundamental studies of structural, chemical, electrical, and optical properties of SIPOS deposited over a wide range of compositions on various substrates to the fabrication of transistors with polycrystalline and SIPOS emitters. Much effort has also been directed toward the ion implanted base where numerous techniques for forming the shallow implant and maintaining the profile during further processes were investigated. GRA

N86-12511# Department of the Navy, Washington, D. C.
A TiW DIFFUSION BARRIER FOR AuZn OHMIC CONTACTS TO p-TYPE InP Patent Application
J. B. Boos, N. A. Papanicolaou, and T. H. Weng, inventors (to Navy) Filed 27 Jun. 1985 27 p
(AD-D011823; US-Patent-Appl-SN-749238) Avail: NTIS HC A03/MF A01 CSCL 09/1

This abstract discloses a low metal resistance ohmic contact alloyed to p InP material having TiW within the contact as a diffusion barrier layer between an underlay of AuZn and an overlay of Au. A process for fabricating an InP JFET containing a gate contact of respective AuZn, TiW, and Au layers and with the gate contact alloyed to p InP material of a semiconductive gate region provides an improved InP JFET having a low resistance metal alloyed ohmic contact to the gate region. Use of the TiW layer in a multilayer contact alloyed to p InP material leads to unique processing and improved InP Semiconductor devices. GRA

N86-12512# Department of the Navy, Washington, D. C.
HIGH CURRENT FIBER BRUSH COLLECTOR AND METHOD FOR MAKING SAME Patent Application
S. J. Scuro, inventor (to Navy) Filed 2 May 1985 12 p
(AD-D011827; US-Patent-Appl-SN-729761) Avail: NTIS HC A02/MF A01 CSCL 09/1

This patent application discloses an axial-type homopolar motor having high density, high current fiber brush collectors affording efficient, low contact resistance and low operating temperatures. The collectors include a ring of concentric rows of brushes in equally spaced beveled holes soldered in place using a fixture for heating the ring to just below the solder melting point and a soldering iron for the local application of additional heat at each brush. Prior to soldering, an oxide film is formed on the surfaces of the brushes and ring, and the bevels are burnished to form a wetting surface. Flux applied with the solder at each bevel removes to an effective soldering depth the oxide film on the brushes and the holes. Author (GRA)

N86-12513# Department of the Navy, Washington, D. C.
DUAL DRAIN MOSFET DETECTOR FOR CROSSTIE MEMORY SYSTEMS Patent Application
N. Bluzer, inventor (to Navy) Filed 22 Mar. 1985 14 p
(AD-D011828; US-Patent-Appl-SN-714775) Avail: NTIS HC A02/MF A01 CSCL 09/5

This patent application, which discloses a circuit for detecting binary information in crosstie memory systems includes a dual drain MOSFET device having a single channel with a common source and an integrated, thin-film strip of magnetic material

suitable for the storage and propagation of Bloch line-crosstie pairs acting as both a shift register and the device's gate. Current flowing through the device, in the absence of a magnetic field, is equally distributed to each drain; however, changing magnetic fields, normal to the plane of the device and generated by Bloch line-crosstie pairs in the strip, interact with the current such that a distribution imbalance exists and one drain or the other receives a disproportionate fraction of the current depending upon the direction of the magnetic field. GRA

N86-12514# Rome Air Development Center, Griffiss AFB, N.Y.
EVALUATION OF THE USE OF p-n STRUCTURES AS PHOTODETECTORS IN SILICON INTEGRATED CIRCUITS Report, Jan. 1984 - Mar. 1985
C. A. Eldering Jun. 1985 97 p
(AF Proj. 2338)
(AD-A158104; RADC-TR-85-123) Avail: NTIS HC A05/MF A01 CSCL 09/1

The light sensitivity of p-n junctions in silicon integrated circuits has been investigated and the spectral and temporal response of several structures in an integrated circuit measured. A model for the spectral response was developed based on models previously used to study solar cell response. This model takes into account the depth and the active area of the carrier collecting junction and demonstrates the shifting of the peak spectral response towards shorter wavelengths as junction depth and active area decreases. Measurements of the spectral response of junctions in an integrated circuit were compared with the predicted responses. An investigation into the temporal response of p-n photodiodes has shown that the response time of the diode is dependent on both the geometry of the junction and the wavelength of light generating the carriers. Response times for structures in the integrated circuit were measured using a He-Ne laser operating at 0.632 micron. GRA

N86-12515# Reliability Analysis Center, Griffiss AFB, N. Y.
SEARCH AND RETRIEVAL INDEX TO EOS/ESD SYMPOSIUM PROCEEDINGS 1979 TO 1984
R. E. Rash, Jr. and R. T. Wanner 15 Apr. 1985 149 p
(Contract F30602-84-C-0162)
(AD-A158114; RAC-TRS-4) Avail: NTIS HC A07/MF A01 CSCL 09/5

This book contains indexes used in searching for information contained in papers produced in Electrical Overstress/Electrostatic Discharge (EOS/ESD) Symposium 1979 to 1984. These indexes are the Alphabetical List of Index Terms, Subject Index, Author Index, Corporate Index, Keywords in Title Index, and Chronological List of Papers Index. These indexes provide a clear, easy-to-read, and concise method of searching for and retrieving the valuable information contained in IRPS Proceedings. GRA

N86-12516# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
ELECTRICAL LOSSES AND RESISTANCE OF CRYOGENIC INDUCTORS WITH CONSIDERATION OF THE EFFECT OF MAGNETORESISTANCE
A. I. Bertinov, B. L. Aliyevskiy, A. G. Sherstyuk, V. L. Orlov, and G. P. Alabin 26 Jul. 1985 11 p Transl. into ENGLISH from Izv. Akad. Nauk SSSR Energ. i Transport (USSR), no. 6, Nov. - Dec. 1972 p 72-77
(AD-A158185; FTD-ID(RS)T-1356-84) Avail: NTIS HC A02/MF A01 CSCL 09/1

A semigraphical method of calculating the electrical losses and resistance of round induction coils made of especially high purity metals (hyperconductors) - aluminum, beryllium, copper - with cryogenic cooling was developed. The peculiarity of the calculation is that it considers the effect of magnetoresistance. It uses the experimental values of the specific electrical resistance of the metals depending on the value of the induction of the transverse magnetic field at a constant low temperature. The experimental data are approximated by polynomials. Author (GRA)

N86-12517# Department of the Army, Washington, D. C.
WIDEBAND SAW (SURFACE ACOUSTIC WAVE) CHANNELLIZER USING SLANTED ARRAY INPUT TRANSDUCER Patent Application
E. A. Mariani and W. J. Skudera, Jr., inventors (to Army) Filed 25 Jun. 1985 11 p
(AD-D011857; US-Patent-Appl-SN-749038) Avail: NTIS HC A02/MF A01 CSCL 09/1

An Acoustic signal processing apparatus for the frequency-partition processing of a wideband RF spectrum surface acoustic wave (SAW) input signal into a multiplicity of relatively narrowband individual contiguous acoustic wave output signals, utilizing a wideband, linearly-dispersive, slanted array input transducer arranged on a wave-conductive surface with multiple arrayed output transducers, each frequency-responsive to a respective band of frequencies emanated from the input transducer is described. Author (GRA)

N86-12518# North Carolina Univ., Chapel Hill.
INVESTIGATION OF PHASE TRANSITIONS Final Report, 20 Jun. 1983 - 2 Mar. 1985
W. E. Hatfield 12 Aug. 1985 10 p
(Contract DAAG29-79-D-1002)
(AD-A158434; ARO-20849.1-PH) Avail: NTIS HC A02/MF A01 CSCL 20/12

An investigation of layers of CuCl grown on the (3) face of silicon has been undertaken. Detailed studies using ESCA for analysis have led to the development of an effective etching and cleaning procedure for silicon surfaces. The CuCl layers can not be grown by vapor phase transport, nor from liquid fluxes using a dipping technique, but polycrystalline layers may be grown using an improved slider-boat technique. The CuCl/silicon specimens exhibit a dielectric anomaly. The temperature of the onset of the dielectric anomaly varies from specimen to specimen, and it also depends on the history of the specimen. Materials research designed to determine the factors which affect this phenomenon is underway. GRA

N86-12519# Los Alamos Scientific Lab., N. Mex.
FOIL FUSES AS OPENING SWITCHES FOR SLOW DISCHARGE CIRCUITS
J. V. Parker and W. M. Parsons 1985 5 p Presented at the 5th IEEE Pulsed Power Conf., Washington, D.C., 10 Jun. 1985
(Contract W-7405-eng-36)
(DE85-014124; LA-UR-85-2021; CONF-850616-64) Avail: NTIS HC A02/MF A01

Metal foil fuses embedded in various materials are widely used as opening switches in fast discharge circuits (approx. 1 (MU)s). Several technologies of current interest require opening switches in circuits which operate on a much longer time scale (approx. 100 (MU)s). We have investigated the behavior of aluminum and copper foil fuses for conduction times of 100 to 200 (MU)s. Reliable current interruption is obtained at the end of melting rather than at the end of vaporization. The ratio of initial to final resistance is $>$ 100. In general, the performance of slow fuses can be predicted by simple scaling from fast fuse behavior. For applications where the switching function depends critically on the resistivity versus input energy characteristic, the results presented can be used in the selection of proper fuse size and geometry. DOE

N86-12520# Argonne National Lab., Ill.
LOW DISPERSION NOTCH FILTER FOR MULTI-GHz FREQUENCIES USING FIBER OPTICS DELAYS
J. D. Simpson and R. Konecny 1985 3 p Presented at the Particle Accelerator Conf., Vancouver, British Columbia, 13 May 1985
(Contract W-31-109-eng-38)
(DE85-014983; ANL/HEP-CP-85-42; CONF-850504-232) Avail: NTIS HC A02/MF A01

Although their designs appear simple and straightforward, notch filters for application in stochastic cooling systems are frequently difficult to construct with acceptable characteristics. Problems arise because the components are less than perfect, coaxial cables

have loss plus dispersion and other necessary hardware has limitations. Usually it is the delay line, typically a high quality coaxial line, which is the source of most problems. We report in this paper on the development of a notch filter which uses a laser diode/fiber optic delay line instead of a coaxial cable. Measurements of its properties indicate it to be a possible alternative to other designs. Bandwidth, dispersion, notch depth, dynamic range and intermodulation are each within the bounds of typical cooling system requirements. DOE

N86-12521# California Univ., Berkeley. Lawrence Berkeley Lab.
DEACTIVATION AND POISONING OF FUEL CELL CATALYSTS
P. N. Ross, Jr. Jun. 1985 6 p Presented at the 3rd Intern. Symp. on Catalyst Deactivation and Poisoning, Berkeley, Calif., 19 Jun. 1985
(Contract DE-AC03-76SF-00098)
(DE85-015127; LBL-19755; CONF-850631-1) Avail: NTIS HC A02/MF A01

The deactivation and poisoning phenomena reviewed are: the poisoning of anode (fuel electrode) catalyst by carbon monoxide and hydrogen sulfide; the deactivation of the cathode (air electrode) catalyst by sintering; and the deactivation of the cathode by corrosion of the support. The anode catalyst is Pt supported on a conductive, high area carbon black, usually at a loading of 10 w/o. This catalyst is tolerant to some level of carbon monoxide or hydrogen sulfide or both in combination, the level depending on temperature and pressure. Much less is known about hydrogen sulfide poisoning. Typical tolerance levels are 2% CO, and 10 ppM H2S. The cathode catalyst is typically Pt supported on a raphitic carbon black, usually a furnace black heat-treated to 2700 C. The Pt loading is typically 10 w/o, and the dispersion (or percent exposed) as-prepared is typically 30%. The loss of dispersion in use depends on the operational parameters, most especially the cathode potential history, i.e., higher potentials cause more rapid decrease in dispersion. The mechanism of loss of dispersion is not well known. The graphitic carbon support corrodes at a finite rate that is also potential dependent. Support corrosion causes thickening of the electrolyte film between the gas pores and the catalyst particles, which in turn causes increased diffusional resistance and performance loss. DOE

N86-12522# Sandia National Labs., Albuquerque, N. Mex.
DESIGN INFORMATION FOR THE 4/3 SILICON-GATE CMOS TECHNOLOGY
S. J. Babicz Jun. 1985 23 p
(Contract DE-AC04-76DP-00789)
(DE85-014932; SAND-85-0052) Avail: NTIS HC A02/MF A01

Enclosed is a 3-Dimensional view of the 4/3 silicon gate layout, showing the different mask layers. The 4/3 design rules are explained in detail, both in written form and pictorially. An explanation of the VAX design rule check, plus charts showing alignment sequence, mask field tones and current biasing are included. Also included are various drawings explaining positive and negative resist, cross sectional view of a silicon gate layout and three examples of different 4/3 layouts (Flipflop, Memory, C(2)L) using the 4/3 design rules. DOE

N86-12523# Oak Ridge National Lab., Tenn.
ARC DISCHARGE CONDITIONING TEST ON THE OAK RIDGE 25 URC ACCELERATOR
N. F. Ziegler, P. H. Stelson, and C. M. Jones 1985 15 p Presented at the 4th Intern. Conf. on Electrostatic Accelerator Technol. and Assoc. Boosters, Buenos Aires, 15 Apr. 1985 Prepared in cooperation with National Electrostatics Corp., Middleton, Wisc.
(Contract DE-AC05-84OR-21400)
(DE85-016394; CONF-850470-8) Avail: NTIS HC A02/MF A01

A hydrogen arc discharge has been run in the top five units (fifteen 20 cm tube sections) of the ORNL tandem accelerator to test the effectiveness of this method of cleaning the high voltage electrodes. The discharge was maintained in both the high and low-energy tubes for a period of 6 hours. The arc current in each tube was 4.0 Å and the hydrogen pressure was nominally 100 mTorr. The arc discharge does not appear to have significantly affected the operating voltage of the top five units of the accelerator. However, the voltage conditioning behavior of the tested units is markedly different. DOE

N86-12524# Sandia National Labs., Albuquerque, N. Mex.
HYBRID 0-D,1-D, AND 2-D MODEL OF HELICAL EXPLOSIVE-DRIVEN MAGNETIC FLUX COMPRESSION GENERATOR
T. J. Burgess 1985 9 p Presented at the 5th IEEE Power Conf., Washington, D.C., 10 Jun. 1985
(Contract DE-AC04-76DP-00789)
(DE85-013772; SAND-85-1293C; CONF-850616-43) Avail: NTIS HC A02/MF A01

A hybrid code model of the Sandia National Laboratories' model 632 is described is introduced. A very large explosive driven magnetic flux compression generator. This involves the use of two codes. The first is a coupled 0-D equivalent circuit model and 1-D magnetohydrodynamic computation. The second is the 2-D materials response code, CSQ. This is used to obtain an equivalent drag coefficient so that the 2-D stator coil conductor encapsulent interaction can be modeled in the 1-D code. DOE

N86-12525# Sandia National Labs., Albuquerque, N. Mex.
PREVENTATIVE MAINTENANCE FOR CONTROL SYSTEMS
G. O. Corbett May 1985 3 p Presented at the Maintenance Seminar, Albuquerque, N. Mex., 11 Jun. 1985
(Contract DE-AC04-76DP-00789)
(DE85-012029; SAND-85-1159C; CONF-8506129-1) Avail: NTIS HC A02/MF A01

Preventative maintenance of the control systems should be performed on a required interval. Most manuacturers specify 6 to 12 month intervals. However, inspections can often be accomplished when the control unit or mechanical systems are out of service for a malfunction repair. A procedural checklist for proper maintenance is given. DOE

N86-12526# California Univ., Davis. Dept. of Electrical and Computer Engineering.
EVALUATION AND IMPLEMENTATION OF TESTABILITY SCHEMES FOR GATE ARRAY INTEGRATED CIRCUIT DESIGN Final report, 1 Feb. - 30 Sep. 1984
K. W. Current, F. Edwards, and S. Hayano 8 Mar. 1985 57 p
(Contract W-7405-eng-48)
(DE85-012874; UCRL-15676) Avail: NTIS HC A04/MF A01

The research undertaken involved efforts on two distinct testing problems associated with large-scale (LSI) and very-large-scale (VLSI) integrated circuits. One problem concerns the debugging of chip test set-ups, a chip that generates a unique identifying signal on each of its pads could be useful. Such a chip could drive each wiring connection which could then be sampled. The design, realization, and characteristics of such a tester chip are discussed. Also, several design for testability schemes for chips are summarized and their potential for use in gate array design procedures is discussed. DOE

N86-12527# Air Force Weapons Lab., Kirtland AFB, N. Mex.
PARALLEL, STAGED OPENING SWITCH POWER CONDITIONING TECHNIQUES FOR FLUX COMPRESSION GENERATOR APPLICATIONS
R. E. Reinovsky, P. S. Levi, J. C. Bueck, and J. H. Goforth 1985 31 p Presented at the 5th IEEE Pulsed Power Conf., Washington, D.C., 10 Jun. 1985 Prepared in cooperation with LANL
(Contract W-7405-eng-36)
(DE85-012761; LA-UR-85-1891; CONF-850616-8) Avail: NTIS HC A03/MF A01

The Air Force Weapons Laboratory, working jointly with Los Alamos National Laboratory, has conducted a series of experiments directed at exploring composite, or staged, switching techniques for use in opening switches in applications which require the conduction of very high currents (or current densities) with very low losses for relatively long times (several tens of microseconds), and the interruption of these currents in much shorter times (ultimately a few hundred nanoseconds). The results of those experiments are reported. DOE

N86-12528# Los Alamos National Lab., N. Mex.
CALCULATION OF SERIES CAPACITANCE FOR TRANSIENT ANALYSIS OF WINDINGS
P. Chowdhuri Jan. 1985 8 p Presented at the IEEE Power Eng. Soc. Summer Meeting, Vancouver, British Columbia, 14 Jul. 1985
Avail: NTIS HC A02/MF A01

The analysis of transient voltage oscillations inside a winding (transformer, reactor or magnet) is performed by representing the winding as a lumped ladder network. The capacitances to the return lead (or ground) C sub gi can be computed by assuming either equivalent parallel-plate or cylindrical-symmetry configuration. The equivalent series capacitances of a winding C sub si, however, are complex capacitance networks, consisting of intra- and intercoil turn-to-turn capacitances of the coil sections. Many researchers have proposed methods of computing the equivalent series capacitance of a winding. As each method is quite different from the others, the analysis of the transient behavior of a winding becomes uncertain. A method of computing the series capacitance of a winding is proposed which is mathematically rigorous but simple to execute. As a check, the equivalent series capacitance of a four-turn double-disk winding was computed by the proposed method as well as by simple circuit analysis. The computations corraborated each other. DOE

N86-12529# Los Alamos National Lab., N. Mex.
SELF-CONSISTENT KLYSTRON SIMULATIONS
E. E. Carlsten and P. J. Tallerico 1985 4 p refs Presented at the Particle Accelerator Conf., Vancouver, British Columbia, 13 May 1985
(Contract W-7405-eng-36)
(DE85-012678; LA-UR-85-1588; CONF-850504-105) Avail: NTIS HC A02/MF A01

A numerical analysis of large signal klystron behavior based on general wave particle interaction theory is presented. The computer code presented is tailored for the minimum amount of complexity needed in klystron simulation. The code includes self consistent electron motion, space charge fields, and intermediate and output fields. It also includes use of time periodicity to simplify the problem, accurate representation of the space charge fields, accurate representation of the cavity standing wave fields, and a sophisticated particle pushing routine. In the paper, examples are given that show the effects of cavity detunings, of varying the magnetic field profile, of electron beam asymmetries from the gun, and of variations in external load impedance. DOE

N86-12530# Department of Energy, Washington, D. C.
SELF-CONTAINED HOT-HOLLOW CATHODE GUN SOURCE ASSEMBLY Patent Application
J. D. Zeren, inventor (to DOE) Filed Aug. 1984 13 p
(Contract DE-AC04-76DP-03533)
(DE85-011652; US-Patent-Appl-SN-637628) Avail: NTIS HC A02/MF A01

A self contained hot hollow cathode gun source assembly for use in a vacuum chamber includes a crucible having a hot hollow cathode gun mounted underneath and providing a hole for the magnetic deflection of the ion/electron beam into a crucible on top the block. DOE

N86-12531# Sandia National Labs., Albuquerque, N. Mex.
PHOTOCONDUCTIVE SEMICONDUCTOR SWITCHING FOR PULSED POWER APPLICATIONS
F. Zutavern, M. OMalley, M. Buttram, and W. Stygar 1985 14 p Presented at the 5th IEEE Pulsed Power Conf., Washington, D.C.
(Contract DE-AC04-76DP-00789)
(DE85-013859; SAND-84-2409C; CONF-850616-31) Avail: NTIS HC A02/MF A01

Photoconductive semiconductor switches hold significant promises as high-voltage, high-current switches for pulsed power applications. Their most important contributions are picosecond rise time and jitter, and millisecond recovery times. A crucial factor in their development is their surface breakdown strength. Despite the lack of improvement shown to date, there are still many techniques to be tried and we consider the chances of significant improvement to be good. In addition to working on the surface breakdown problem, our plans include the construction of a 1 MV, 5 (UC OMEGA) PCSS. DOE

N86-12532# Los Alamos National Lab., N. Mex.
RACETRACK MICROTRON RF SYSTEM
P. J. Tallerico and D. R. Keffeler 1985 3 p refs Presented at the Particle Accelerator Conf., Vancouver, Can., 13 May 1985
(Contract W-7405-eng-36)
(DE85-012669; LA-UR-85-1608; CONF-850504-1608) Avail: NTIS HC A02/MF A01

The RF system for the National Bureau of Standards (NBS)/Los Alamos CW racetrack microtron is described. The low-power portion consists of five 75-W amplifiers that drive two input ports in each of two chopper deflection cavities and one port in the prebuncher cavity. A single 500-kW klystron drives four separate 2380-MHz cavity sections: the two main accelerator sections, a capture section, and a preaccelerator section. The phases and amplitudes in all cavities are controlled by electronic or electromechanical controls. The 1-MW klystron power supply and crowbar system were purchased as a unit; several modifications are described that improve power-supply performance. The entire RF system has been tested and shipped to the NBS, and the chopper-buncher system has been operated with beam at the NBS. DOE

N86-12533# Sandia National Labs., Albuquerque, N. Mex.
HILLOCK-FREE CONDUCTOR SYSTEM FOR USE IN MULTI-LEVEL INTERCONNECTS
B. I. Draper, T. A. Hill, and H. B. Bell 1985 13 p Presented at the VLSI Multilevel Interconnection Conf., Santa Clara, Calif., 24 Jun. 1985
(Contract DE-AC04-76DP-00789)
(DE85-012595; SAND-84-2612C; CONF-8506123-1) Avail: NTIS HC A02/MF A01

A new conducter, consisting of layers of pure aluminum and tantalum silicide, was developed for use in integrated circuit multilevel metallizations. Unlike other conductor systems commonly in use or recently proposed, this structure maintains a smooth (< 30 nm roughness), hillock-free surface and a resistivity of less than 3.5 micron (UC OMEGA)-cm even after repeated thermal cycling to 450 C. Surface roughness after thermal cycling was studied as a function of the number, thickness, and position of the tantalum silicide layers. No lateral growth of material was observed during thermal cycling of 2 mircon m wide lines. Profiling Auger spectroscopy and backscattering techniques show that layers do not interdiffuse at high temperatures. In addition, the composite conductor is easily patterned using reactive ion etching (RIE) techniques, provides for the nucleation of selectively deposited LPCVD tungsten for interlevel via fills, and forms stable, low resistance (< 3 (UC OMEGA)) interlevel contacts. DOE

N86-12534# Varian Associates, Palo Alto, Calif.
THE 140 GHz GYROTRON DEVELOPMENT PROGRAM Quarterly Report, Mar. - Jun. 1984
K. L. Felch, R. E. Bier, L. J. Craig, T. S. Fiddaman, L. J. Fox, G. Bu, H. E. Huey, H. R. Jory, P. I. Reysner, and A. Salop 1984 83 p
(Contract DE-AC05-84OR-21400)
(DE85-011923; ORNL/Sub-84-95128/2; QR-1) Avail: NTIS HC A05/MF A01

The objective of this program is to develop a gyrotron oscillator capable of producing 100 kW of CW power at 140 GHz. Most aspects of the conceptual design for the first experimental tube are reported and initial calculations for several critical elements of the second experimental tube are discussed. The specification for the superconducting gyrotron magnet is presented. The various microwave components, protective devices, and special diagnostics required to test the tubes are identified and their design summarized. DOE

N86-12535# Los Alamos National Lab., N. Mex.
DESIGN OF FOIL IMPLOSION SYSTEM FOR PIONEER 1 EXPER-

IMENTS
D. J. Erickson, R. S. Caird, C. M. Fowler, W. T. Leland, H. Oona, R. J. Trainor, J. B. VanMarter, B. L. Barthell, D. V. Duchane, and J. H. Goforth 1985 5 p Presented at the 5th IEEE Pulsed Power Conf., Washington, D.C., 10 Jun. 1985
(Contract W-7405-eng-36)
(DE85-014111; LA-UR-85-2078; CONF-850616-67) Avail: NTIS HC A02/MF A01

A foil implosion system is described that integrates an explosive flux-compression generator, a flat plate feed section with power conditioning switches, and a vacuum electrode region containing a cylindrical foil/plasma load. Power conditioning, obtained with an explosive-driven plasma compression opening switch and explosive-actuated closing switches, provides a submicrosecond multimegampere pulse for the implosion of an aluminum plasma. The flat plate section is configured for bidirectional feed to the coaxial vacuum electrodes. Important considerations in the design of the vacuum power flow region include gap failure, feed symmetry, and radial diagnostic access. The system presently accommodates a foil radius of 3 cm. Innovative foil insertion and clamping techniques are also described. DOE

N86-12536# Sandia National Labs., Albuquerque, N. Mex.
CLASSICAL PIEZOELECTRICITY: IS THE THEORY COMPLETE
P. J. Chen 1985 14 p Presented at the Workshop on Dyn. Probl. in Continuum, Minneapolis, 3 Jun. 1985
(Contract DE-AC04-76DP-00789)
(DE85-014592; SAND-85-1441C; CONF-8506159-1) Avail: NTIS HC A02/MF A01

This paper cites experimental evidences which show that the classical theory of piezoelectricity is not complete in describing the responses of ferroelectric ceramics. There are also some preliminary evidences to show that the theory as applied to piezoelectric single crystals needs more thorough investigations. DOE

N86-12537# Sandia National Labs., Albuquerque, N. Mex.
LASER-BASED FOILLESS DIODE
S. L. Shope, C. A. Frost, G. T. Leifeste, C. E. Crist, and J. W. Poukey 1985 11 p Presented at the SDIO/DARPA Ann. Propagation Rev., Monterey, Calif., 24 Jun. 1985
(Contract DE-AC04-76DP-00789)
(DE85-013958; SAND-85-1338C; CONF-8506141-3) Avail: NTIS HC A02/MF A01

A foilless diode usually requires an externally applied magnetic field to control expansion and transport of a relativistic electron beam. A new foilless diode has been developed that does not require an external magnetic field. A low pressure organic gas is introduced into the diode and the transport region. A uv laser beam is injected through the transport region and is terminated at the cathode. The laser photoionizes the low pressure gas forming an ionized channel that captures the electron beam near the cathode. The electron beam is focused and guided by electrostatic attraction to the ionized channel. A 1.5-MeV, 20-KA electron beam has been generated and transported 1 m using this technique. Author

N86-12538# Sandia National Labs., Albuquerque, N. Mex.
SEMICUSTOM INTEGRATED CIRCUIT DESIGN AT SANDIA NATIONAL LABORATORIES
C. F. Acken Jul. 1985 65 p
(Contract DE-AC04-76DR-00789)
(DE85-015661; SAND-85-8226) Avail: NTIS HC A04/MF A01

This report is intended to serve as a reference for first time or one in a while designers of semicustom integrated circuits (ICS). The contents are specific to the design style, technology, and fabrication process used by Sandia National Laboratories in the design and fabrication of 4/3 micron radiation hardened CMOS standard cell and gate array integrated circuits. The topics covered in the report include an overview of semicustom IC design at Sandia, the design methodology and specific details relating to the design of a semicustom IC. DOE

N86-12539# Lawrence Livermore National Lab., Calif.
ELECTRONICS ENGINEERING DEPARTMENT THRUST AREA REPORT FY'84
C. Minichino, ed. and P. L. Phelps, ed. 1985 252 p
(Contract W-7405-eng-48)
(DE85-014857; UCID-20110-84) Avail: NTIS HC A12/MF A01

Thrust Areas for FY'84: diagnostics and microelectronic engineering; signal and control engineering; microwave and pulsed power engineering; computer-aided engineering; engineering modeling and simulation; and systems engineering. For each Thrust Area, an overview and a description of the goals and achievements of each project is provided. DOE

N86-12540# Lawrence Livermore National Lab., Calif.
EE TECHNICAL REVIEW
Jun. 1985 40 p
(Contract W-7405-eng-48)
(DE85-015313; UCRL-50025-85-1) Avail: NTIS HC A03/F A01

Areas of research reported include: ultrafast gating of microchannel plate X-ray spectrometers, study of power MOS fast switching techniques, and lightning vulnerability of nuclear explosive test systems at the Nevada Test Site. Also included is a study of a computer model of the MFTF-B neutral beam accel dc power supply. DOE

N86-12385# Tohoku Univ., Sendai (Japan). Research Inst. of Electrical Communication.
HYSTERESIS CHARACTERISTICS OF A DIODE LOADED E-M LOOP SENSOR
Hiroshi Echigo *In its* The Record of Elec. and Commun. Eng. Conversazione, Vol. 54, No. 1 Aug. 1985 p 9-13 refs In JAPANESE; ENGLISH summary (For primary document see N86-12383 03-31)
Avail: NTIS HC A03/MF A01

N86-12387# Tohoku Univ., Sendai (Japan). Research Inst. of Electrical Communication.
THE VERIFICATION OF THE LOGIC CIRCUITS BASED ON PARTICLIZED INFORMATION BITS WITH PROLOG
Yoshiaki Takai, Fusao Nakagawa, Tadao Nakamura, and Yoshiharu Shigei *In its* The Record of Elec. and Commun. Eng. Conversazione, Vol. 54, No. 1 Aug. 1985 p 20-25 refs In JAPANESE; ENGLISH summary (For primary document see N86-12383 03-31)
Avail: NTIS HC A03/MF A01

N86-12412# Joint Publications Research Service, Arlington, Va.
THE STEP STRUCTURE EFFECT OF dc JOSEPHSON CURRENT WITHIN ONE FLUX QUANTUM PERIOD phi SUB ZERO (2)
Zhang Yuheng, Shen Xiuling, Zheng Jiefei, and Wu Yan *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-017) 11 Jun. 1985 p 104-114 refs Transl. into ENGLISH from Wuli Xuebao (Beijing), v. 33, no. 8, Aug. 1984 p 1075-1083 (For primary document see N86-12408 03-31)
Avail: NTIS HC A08/MF A01

N86-12433# Joint Publications Research Service, Arlington, Va.
EXPERIMENTS WITH DOMESTIC IC SUBSTRATES
Guan Shuzhu and Li Dunfu *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-034) 1 Oct. 1985 p 59-66 refs Transl. into ENGLISH from Dianzi Jishu (Shanghai), v. 12, no. 5, 20 May 1985 p 12-14 (For primary document see N86-12430 03-31)
Avail: NTIS HC A08/MF A01

N86-12437# Joint Publications Research Service, Arlington, Va.
SUPERCONDUCTING WIRE MANUFACTURED
Fu Yuexian, Sun Yue, Xu Shiming, and Peng Ying *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-034) 1 Oct. 1985 p 85-86 refs Transl. into ENGLISH from Diwen Wuli (Beijing), v. 7, no. 2, Jun. 1985 p 164-165 (For primary document see N86-12430 03-31)
Avail: NTIS HC A08/MF A01

N86-12443# Joint Publications Research Service, Arlington, Va.
LATCH-UP EFFECT IN CMOS DESCRIBED

Zhang Lichun, Yan Timing, Ni Xuewen, Yan Guizhen, Feng Chuguang, and Zhang Ziang *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-022) 11 Jul. 1985 p 35-41 refs Transl. into ENGLISH from Dianzi Kexue Jishu (Beijing), v. 15, no. 1, 10 Jan. 1985 p 2-4 (For primary document see N86-12439 03-31)
Avail: NTIS HC A09/MF A01

N86-12468# Joint Publications Research Service, Arlington, Va.
CAD PROGRAM FOR HIGH-POWER ELECTRON GUN WITH ANNULAR CATHODE DESCRIBED
Tu Yushan *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-032) 19 Sep. 1985 p 113-117 refs Transl. into ENGLISH from Dianzi Xuebao (Beijing), no. 4, Nov. 1984 p 95-97 (For primary document see N86-12462 03-31)
Avail: NTIS HC A08/MF A01

34 FLUID MECHANICS AND HEAT TRANSFER

Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling.

For related information see also *02 Aerodynamics* and *77 Thermodynamics and Statistical Physics.*

N86-12541 California Univ., Berkeley.
NUMERICAL CALCULATION OF TURBULENT BUOYANT FLOW Ph.D. Thesis
Wai-Ming To 1984 186 p
Avail: Univ. Microfilms Order No. DA8513016

Two models were developed for predicting low Reynolds number turbulent flows in the free and mixed convection regimes. One, the KEM model, is based on the notion of eddy diffusivities for momentum and heat. The other, the ASM model, is based on algebraic relations derived for the anisotropic turbulent fluxes by suitable truncation of the parent transport equations. Both formulations apply to variable property flows with high overheat ratios. Fully elliptic forms of the differential transport equations, subject to appropriately specified boundary conditions, were solved numerically for two flow configurations. Both are two dimensional. The first corresponds to free convection along a heated vertical flat plate, the second to free and mixed convection from a heated cavity of rectangular cross-section and variable orientation. A comparison between measurements and predictions for the case of the vertical plate shows that both models yield fairly accurate results for the mean flow and heat transfer. Dissert. Abstr.

N86-12542 Cornell Univ., Ithaca, N.Y.
UNSTEADY DETONATION Ph.D. Thesis
Abraham Ayowole Oyediran 1985 182 p
Avail: University Microfilms Order No. DA8504551

This work is centered on steady and unsteady detonation waves. This work is concerned with plane one-dimensional waves with onestep irreversible reactions of the ARrhenius kind. Generic problem is considered in the transition from deflagration to detonation. IT is modelled as the overtaking of a steady deflagration wave by a steady shock wave. Such a collision produces a detonation wave (as well as a contact discontinuity, a back shock and sometimes a rarefaction wave). Here the restriction to small heat release is removed. It is shown that a detonation wave thus produced can never be steady for any amount of heat release. The analysis was done in the limit of large activation energy. The governing equation for a detonation was developed in the limit of large activation energy and (subsequently) small heat release. Steady detonation solutions were investigated and a linear stability analysis was caried out. Various numerical techniques were used to solve the Stefan problem of detonation theory.
Dissert. Abstr.

N86-12543 Michigan Univ., Ann Arbor.
SHEAR DRIVEN FILM FLOW BEHAVIOR AND CAVITATION STUDY Ph.D. Thesis
Bong-Hwa Sun 1985 331 p
Avail: Univ. Microfilms Order No. DA8512517

Two complicated important multiphase flow phenomena, shear driven thin film flow and cavitation were studied experimentally. Results were compared with available theoretical models. The main objectives were to study: (1) fluid property effects on shear driven films and interfacial wave structures, and (2) the cavitation flow fields including the effects of long-chain polymer additives (AP-30 and Hec-H) on the cavitation erosion. It is found that: (1) film temperature on the turbine blade surface is equal to the local saturated steam temperature and is independent of water flow rate and water temperature in the reservoir, (2) both high viscosity and long chain polymer additive stabilize the film flow, while low surface tension is destablizing, (3) Mikielewicz's model can be used to predict the transition between rivulet and continous film. (4) Ishii's model can be used to predict transition between continuous film and atomization film flow, (5) Von Karman's universal velocity profile can be used for modelling shear driven film flow. Dissert. Abstr.

N86-12544 Northwestern Univ., Evanston, Ill.
NUMERICAL CALCULATION OF INTERNAL FLOWS WITH CURVATURE Ph.D. Thesis
Iman Esmat Osman ElDib 1985 300 p
Avail: Univ. Microfilms Order No. DA8511815

Flow in curved pipes involves secondary flows and possibly streamwise separation. An efficient numerical scheme yielding reliable predictions for such flows is presented. This is accomplished by using a simple turbulence model that reproduces the main features of the flow in curved pipes and fits with a numerical scheme suitable for such complex flow geometries. The numerical scheme used in this study is called Bodyfit and it solves the three dimensional elliptic equations of motion using the technique of boundary fitted coordinate transformation. A two equation K-epsilon turbulence model is used. The distribution of the eddy viscosity is calculated by solving two partial differential equations for the turbulence kinetic energy and its volumetric rate of dissipation simultaneously with the set of basic equations of momentum and continuity. The finite difference equations are solved using a cell by cell successive over-relaxation method (SOR). Computations were made for both laminar and turbulent flows in straight and strongly curved pipes of circular cross section. The numerical scheme gives a table solution for mean velocity and turbulence quantities. A modified pressure equation is recommended. Dissert. Abstr.

N86-12545 State Univ. of New York, Stony Brook.
STUDY OF THE MIST COOLING AND DROPLET DYNAMICS IN TURBULENT FLOW BY USING LDA Ph.D. Thesis
SangKyu Cho 1984 225 p
Avail: Univ. Microfilms Order No. DA8513530

The schemes which allow the in-situ measurement of droplet size and two components of velocity by the Laser Doppler Anemometer system are presented. The small droplet measurement technique and the large droplet measurement technique are described. The path length correction scheme is explained and the amplitude correction scheme is proposed for small droplet size measurement scheme. A scheme of simultaneous measurement of large droplet size and the two components velocity is developed and verified by the validation experiments. The on-line data acquisition system and the signal processing instrumentation are described. A droplet deposition phenomenon from a turbulent flow on a plate is investigated. The dimensionless deposition coefficient is studied theoretically based on the droplet's frequency response characteristics to the surrounding eddy motion. An investigation was made on the droplet's behavior across the quenched grid spacer. The empirical correlations on the Sauter Mean Diameter and the Fractional Volume of the small droplets are obtained. Dissert. Abstr.

N86-12546 State Univ. of New York, Stony Brook.
THE PREDICTION OF FULLY DEVELOPED TURBULENT PRESSURE DROPS IN A TRIANGULAR DUCT FOR A POWER LAW

FLUID Ph.D. Thesis
Tiee-Dan Chang 1984 129 p
Avail: Univ. Microfilms Order No. DA8513517

A model in which the nondimensional eddy viscosity and velocity distributions in circular pipe flow are applicable to noncircular passage flows was applied to the prediction of fully developed turbulent pressure drops in triangular ducts for Newtonian and power law fluids. The numerical calculations for the predicted turbulent velocity profiles and friction factors in triangular ducts were carried out by utilizing a modified integral transformation after Krajewski and the laminar velocity solutions for power law fluids. Friction factors for Newtonian and power law fluid flows were experimentally investigated over a Reynolds number range of 500 to 40000 in isosceles triangular ducts having apex angles of 10 and 60 degrees. Comparisons were made between the theoretical and experimental results. For the 60 degree duct, the model was successful in predicting friction factor-Reynolds number relations for power law fluids in the range $0.857 < n < 1$. For the 10 degree duct, the model was unable to account for the laminarization of the flow in the apex region and the presence of secondary flows. Dissert. Abstr.

N86-12547* National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
TECHNIQUE FOR MEASURING GAS CONVERSION FACTORS Patent
Jag J. Singh and Danny R. Sprinkle, inventors (to NASA) Issued 3 Sep. 1985 6 p Filed 23 Jul. 1984 Supersedes N84-32786 (22 - 22, p 3598)
(NASA-Case-LAR-13220-1; US-Patent-4,538,446; US-Patent-Appl-SN-633179; US-Patent-Class-73-3; US-Patent-Class-73-861.07) Avail: NTIS HC A02/MF A01 CSCL 20D

A method for determining hydrocarbon conversion factors for a flowmeter. A mixture of air, O2 and C sub x H sub y is burned and the partial paressure of O2 in the resulting gas is forced to equal the partial pressure of O2 in air. The flowrate of O2 flowing into the mixture is measured by flowmeter and the flowrate of C sub x H sub y flowing into the mixture is measured by the flowmeter conversion factor is to be determined. These measured values are used to calculate the conversion factor. Dissert. Abstr.

N86-12548 Rensselaer Polytechnic Inst., Troy, N. Y.
ANALYTICAL AND EXPERIMENTAL STUDIES OF WAKES BEHIND CIRCULARLY CAPPED BUBBLES Ph.D. Thesis
Warren F. Bessler 1984 230 p
Avail: Univ. Microfilms Order No. DA8509644

The wakes behind circularly capped bubbles are examined by means of an experimental and analytical study. A single two-inch diameter bubble is injected into a six by three foot fluid column, one half inch thick, producing an essentially two-dimensional flow. Aspirin powder placed in the fluid column just prior to bubble release highlights the structure of the flow field before dissolving. High speed film and sequenced photographs are taken to document the observed results. Pressure-time measurements are made with sensitive capacitive transducers mounted in the rear column wall and are synchronized with photographs using a high speed clock. Experimental fluids, prepared by mixing water and glycerine in varying proportions, are used to study the effects of viscosity on bubble shape and wake structure. Testing is performed over a range of Reynolds numbers from 14 to 29,655 which includes the transition from circularly capped to ellipsoidal bubble shape. Experimental data is reduced and summarized in convenient dimensionless form to permit comparison with analytical predictions. Author

N86-12549 Johns Hopkins Univ., Baltimore, Md.
MEASUREMENTS ON AN AXISYMMETRIC JET IN A SLOW COFLOWING STREAM Ph.D. Thesis
Dana A. Walker 1985 136 p
Avail: Univ. Microfilms Order No. DA8510446

All previously measured round turbulent jets are either contained in a recirculation region of are immersed in a coflowing stream which is too strong to obtain normal jet development. The purpose of this research is to include a slow, coflowing stream to avoid recirculation without greatly altering the development of the jet. The flow consists of a round water jet with Reynolds number, U sub j/nu d/ = 25000, submerged in a water tunnel with external stream velocity, U sub s = U sub j 150. The width of the duct is 64 times the nozzle diameter. This combination of duct size and velocity ratio results in no recirculation while the development of the jet resembles the development of a jet with no coflow. Velocity and concentration are surveyed in the jet by optical techniques. Velocity is measured by frequency-shifted laser Doppler velocimetry; concentration is measured by laser-induced fluorescence (of fluorescein sodium). Fluorescence intensity is also used to examine the concentration of reaction-product in an acidbase reaction between the jet and surrounding fluid. Requirements and applications of the fluorescence technique are also examined. Author

N86-12550*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va. Dept. of Mathematics.
AN ASYMPTOTIC INVESTIGATION OF THE STATIONARY MODES OF INSTABILITY OF THE BOUNDARY LAYER ON A ROTATING DISC Final Report
Philip Hall (Exeter Univ.) Sep. 1985 31 p refs Submitted for publication
(Contract NAS1-17070)
(NASA-CR-177977; ICASE-85-40; NAS 1.26:177977) Avail: NTIS HC A03/MF A01 CSCL 20D

An investigation of high Reynolds number stationary instabilities in the boundary layer on a rotating disc is given. It is shown that in addition to the inviscid mode at high Reynolds numbers, there is a stationary short wavelength mode. This mode has its structure fixed by a balance between viscous and Coriolis forces and cannot be described by an inviscid theory. The asymptotic structure of the wavenumber and orientation of this mode is obtained. A similar analysis is given for the inviscid mode, the expansion procedure used is capable of taking nonparallel effects into account in a self consistent manner. The results are compared to numerical calculations and experimental observations. Author

N86-12551*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
MULTIPLE-SCALE TURBULENCE CLOSURE MODELING OF CONFINED RECIRCULATING FLOWS Interim Report
C. P. Chen Aug. 1985 23 p refs Presented at the 19th Midwestern Mech. Conf., Columbus, Ohio, Sep. 1985
(Contract NASw-3458)
(NASA-CR-178536; NAS 1.26:178536) Avail: NTIS HC A02/MF A01 CSCL 20D

A multiple-scale turbulence closure scheme is developed for the numerical predictions of confined recirculating flows. This model is based on the multiple-time-scale concepts of Hanjalic et al. (1980) and takes into account the non-equilibrium spectra energy transfer mechanism. Problems concerning new formulation of energy transfer rate equations and subsequent model coefficient redefinition and energy spectrum partition are discussed. Comparisons are made with several experiments of internal recirculating flows for the purpose of model validation. Numerical results using the present model show significant improvement of predictive capability over that obtained with the single-scale k-epsilon model and show promising potential for complex turbulent flow predictions. Author

N86-12552# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Aerospace and Ocean Engineering.
NUMERICAL AND EXPERIMENT STUDIES OF 3-D AND UNSTEADY TURBULENT BODY/APPENDAGE/PROPELLER FLOWS Annual Report, No. 2, 15 May 1984 - 14 May 1985
J. A. Schetz and R. L. Simpson 15 Jun. 1985 56 p
(Contract N00014-83-K-0372)
(AD-A157078) Avail: NTIS HC A04/MF A01 CSCL 20/4

The 3-D, turbulent flowfield produced by a propeller operating in the wake of a variable mesh disk has been studied with numerical solutions of the Reynolds-averaged, Navier-Stokes equations and

by detailed experiments in a wind tunnel. The mesh variations of the upstream disk were chosen to produce a simulation of the wake of a streamlined, axisymmetric body with a single, streamlined appendage. Comparisons of measurements and preliminary numerical predictions show good agreement for the velocity profiles behind the propeller. The 3-D flow in the junction between a cylindrical appendage and a hull can produce separation of the trailing portion of the appendage and produces a momentum deficient 3-D boundary layer that is more prone to detachment than the 2-D regions away from the appendage. Detailed measurements of the zero-pressure-gradient boundary layer upstream of an appendage of interest have been made. A procedure has been developed for reducing blockage effects in the test wind tunnel. GRA

N86-12553# Portland State Univ., Oreg. Dept. of Mechanical Engineering.
C0 COLLOCATION SOLUTIONS FOR WEAK-FORMULATION NAVIER-STOKES EQUATIONS Final Technical Report
H. Migliore, E. Ray, and E. McReynolds 19 Jun. 1985 18 p Presented at IMSE (Integral Methods in Sci. and Eng.), 18-21 Mar. 1985
(Contract N00014-78-C-0631)
(AD-A157250) Avail: NTiS HC A02/MF A01 CSCL 20/4

A global collocation procedure was attempted on two-D Navier-Stokes equations, but suffered from significant ringing. Historically, multi-element collocation has been based on Hermit shape functions for Navier-Stokes. Alternative, a weak formulation Navier-Stokes solution was developed using biquadratic Lagrangian functions on element boundaries and discrete Galerkin (collocation) expressions on interiors. To account for pressure, a penalty function expression was evaluated as part of a weighted integral, using bilinear shape functions. This method was exercised on flow through a duct that included a pivoting flap that protruded into the flow where the flap motion and fluid flow interacted. GRA

N86-12554# Hebrew Univ., Jerusalem (Israel). Dept. of Atmospheric Sciences.
THE ORIENTATION DISTRIBUTION OF NONSPHERICAL AEROSOL PARTICLES WITHIN A CLOUD Interim Technical Report
I. Gallily Dec. 1984 13 p
(Contract DAJA45-83-C-0004)
(AD-A157363; ITR-2) Avail: NTIS HC A02/MF A01 CSCL 20/4

Having performed a study on the orientation density function (o.d.f.) of small spheroidal aerosol particles in a general field of an arbitrary strength, it became possible to treat the orientation problem in a turbulent medium. To this end, two interconnected physical models were applied. In the first, the Realizations Model, it was assumed that the turbulent particle field constituted an ensemble of an infinite number of realizations, j, each one of which is characterized by one set of the o.d.f., F(j) (x,t), values. The latter was taken in that model to essentially coincide with previously found solution of the Fokker-Planck equation in the field of the realization. The Micro-turbulence Model, a relation between the so-called turbulent rotational diffusion coefficient of the particles and the physical characteristics of the fluid field was supplied. This coefficient and the Brownian rotational diffusion one, compose the effective diffusion coefficient. GRA

N86-12555# Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab.
INVESTIGATION OF TIDALLY INDUCED TURBULENT FLOW Final Report
N. W. Scheffner Mar. 1985 123 p
(DA Proj. 4A1-61101-A-91-D)
(AD-A157841; WES/MP/HL-85-2) Avail: NTIS HC A06/MF A01 CSCL 20/4

A two-dimensional numerical model was developed for the case of tidally induced turbulent flow. An analysis of shallow-water waves is made followed by the development of a second-order closure Reynolds stress turbulence model for the specific application to shallow-water waves. Verification of the resulting numerical model is made to existing steady-state turbulent flume data. GRA

N86-12556# California Univ., Los Angeles. Dept. of Physics.
MODULATIONS OF DRIVEN NONLINEAR SURFACE WAVES ON WATER AND LIQUID HELIUM-4
R. M. Keolian Jun. 1985 256 p
(Contract N00014-85-K-0370)
(AD-A157958; TR-44) Avail: NTIS HC A12/MF A01 CSCL 20/4

When a trough of water or liquid helium-4 is oscillated vertically at frequency f, waves can form on the surface through the process of parametric resonance at half the frequency of the drive, at f/2, The principle measurement is the liquid height at the end of the trough as a function of time. Nonlinearities determine the response amplitude and give rise to hysteresis. At larger drive amplitudes, the signal at f/2 becomes modulated at frequencies much lower than that of the drive in a variety of ways. One such modulation is smooth with a frequency near one of the low modes of the trough even though it is one of the higher modes that is driven. The surface amplitude is first larger on one end of the trough then larger on the other, oscillating back and forth at the modulation frequency which is of the order of f/20. Several of these frequencies can be present at once; they may be incommensurate (irrationally related) with each other or the drive or they may phase lock. The cause of these modulations are three wave resonant triads formed by a low mode, an intermediate mode, and the driven mode of the trough. Another modulation is characterized by short, sudden drops in amplitudes. These sudden drops are localized in space and propagate back and forth in the trough at nearly the gravity wave velocity. Several drops may be present at once. A third modulation is characterized by extremely deep frequencies--as low as f/2000. It seems to be caused by two adjacent modes, nonlinearly coupled together, slowly exchanging energy back and forth. At still higher drive amplitudes the surface response is chaotic. GRA

N86-12557# Massachusetts Inst. of Tech., Cambridge.
NON-LINEAR CORRECTIONS TO THE LINEAR THEORY FOR THE PREDICTION OF THE CAVITATING FLOW AROUND HYDROFOILS Final Report
S. A. Kinnas Jun. 1985 147 p
(Contract N00014-84-K-0067)
(AD-A158105; OE-85-10) Avail: NTIS HC A07/MF A01 CSCL 02/4

The problem of a partial or supercavitating hydrofoil in linear theory is formulated in terms of integral equations of unknown vortex and cavity source distributions. The general problem is decomposed into one camber, one of thickness, and one of angle of attack. The general solution is given in terms of integrals of known functions over the cavity length for partial or over the chord length for supercavitating hydrofoils. The numerical scheme to compute the integrals is shown to be very accurate and insensitive to the variables of the problem. Cavity shapes obtained from linear and nonlinear theory are compared for certain special cases. Linear theory is shown to be accurate for supercavitating sharp-nosed hydrofoils at moderate angles of attack. The effect of the leading edge radius on the partial cavitation of a hydrofoil is introduced by incorporating Lighthill's correction in the linearized formulation of the problem. Results for certain special cases show the significant role of the leading edge radius on the cavitation of hydrofoils, something also confirmed from experiments conducted at the MIT water tunnel. GRA

N86-12558# Wisconsin Univ., Madison. Mathematics Research Center.
INTERFACIAL STABILITY IN A TWO-LAYER BENARD BAD CAPS LANGUAGE[n]PROBLEM Technical Summary Report
Y. Renardy Apr. 1985 33 p
(Contract DAAG29-80-C-0041)
(AD-A158138; MRC-TSR-2814) Avail: NTIS HC A03/MF A01 CSCL 20/4

A linear stability analysis of the benard problem for two layers

of different fluids lying on top of each other and bounded by free surfaces is considered. The fluids are assumed to be similar and perturbation methods are used to calculate the eigenvalue in closed form. The case of the Rayleigh number and wavenumber of the disturbance being close to the first criticality of the one-fluid Benard problem has been investigated in a previous paper, and was found to exhibit both overstability and convective instability. In this paper, the Rayleigh number is assumed to be less than that of the first criticality of the one-fluid problem, and in this situation, overstability does not occur. An unexpected result is that by an appropriate choice of parameters, it is possible to find linearly stable arrangements with the more dense fluid on top.

Author (GRA)

N86-12559# Department of the Air Force, Washington, D.C.
HEAT PIPE WICK Patent Application
J. E. Beam, inventor (to Air Force) Filed 3 Jul. 1985 13 p
(AD-D011852; US-Patent-Appl-SN-751399) Avail: NTIS HC A02/MF A01 CSCL 13/1

This patent application discloses a heat pipe with an improved wick design which has an unheated section of greater wick wall thickness next to the evaporator section of the heat pipe and on the opposite side of the evaporator section from the condenser section. The greater wick wall thickness acts as a reservoir of liquid heat pipe working fluid to prevent dry out of the wick during pulsed high thermal energy transfer conditions and to eliminate the need to enforce quasisteady state heat input requirements during start-up operation. GRA

N86-12560# Connecticut Univ., Storrs.
A PRELIMINARY FIELD STUDY OF TURBULENT FLOW OVER AND INSIDE A FOREST EDGE Progress Report
J. D. Lin and D. R. Miller 1 Jul. 1985 116 p
(Contract DAAG29-84-K-0017)
(AD-A158409; ARO-21156.1-GS; PR-11) Avail: NTIS HC A06/MF A01 CSCL 04/2

This study focused on field measurements to determine the spatial variability of the turbulence characteristics under various atmospheric and forest canopy conditions. A high-speed multichannel data acquisition system was configured and tested. Fixed and movable observation towers have been set up in the University experimental forest in Coventry, Conn. Two wind velocity sensors, being tested and evaluated in the laboratory for their capability to measure the three-dimensional flow with high turbulence intensity that generally characterizes the flow regime in a forest canopy; are a dual triple-split hot-film probe and a tri-diagonal hot-film probe with a wind octant electronic sensor (WOES). The response of WOES tested in the low-speed wind nozzle appears to be promising and its compatibility with the tri-diagonal hot-film probe is being evaluated. A number of field measures has been conducted over and inside the forest canopy, using a vertical array of velocity sensors which includes a propeller anemometer, and X-hot wire and hot film anemometers. GRA

N86-12561# California State Univ., Long Beach. Dept. of Mechanical Enginerring.
TURBULENCE MODELS FOR BOUNDARY LAYERS ON AXISYMMETRIC BODIES Final Technical Report, Jan. 1984 - Jul. 1985
C. Li and T. Cebeci 22 Jul. 1985 43 p
(Contract N00014-80-C-0326)
(AD-A158552; CSULB/ME-84-9) Avail: NTIS HC A03/MF A01 CSCL 20/4

This report describes two turbulence models for boundary layers on axisymmetric bodies. The turbulence models are the algebraic eddy-viscosity formulation of Cebeci and Smith and the form of the two-equation transport approach suggested by Hanjalic and Launder. In both cases, the governing equations are solved in finite-difference form using Keller's box scheme and the computer program described by Bradshaw, Cebeci, and Whitelaw. The results computed by both models are evaluated for several test cases and discussed in the report. In addition, input and output instructions of a computer program based on the K-epsilon model are given together with a sample calculation. GRA

N86-12562# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Mechanical Engineering.
CROSS FLOW BOILING IN TUBE BUNDLES Final Technical Report
S. C. Yao Aug. 1985 164 p
(Contract N00014-79-C-0623; RR0-2403)
(AD-A158557) Avail: NTIS HC A08/MF A01 CSCL 20/13

The objective of the research described in this thesis is to understand the boiling heat transfer characteristics in the tube bundles. The studies are performed both analytically and experimentally. Analyses are conducted for single phase flow in bundles with various geometries. The results are compared with the available experimental data. Recommendation for simple and general design correlations at special conditions are proposed. Experimental results of forced convective boiling of a horizontal tube in a channel as well as in a bundle are reported. The difference between a single tube in a channel and a tube in a bundle is attributed to the different flow field environment and thermal environment. A modified Chen's correlation can be used to predict the heat transfer performance of a single tube in a channel or in a bundle. An empirical Critical heat flux (CHF) correlation of forced convective boiling from a single tube in a channel is proposed. The agreement of this correlation with the experimental data is reasonable with the maximum deviation of 20%. GRA

N86-12563# Lawrence Livermore National Lab., Calif.
COMPUTER SIMULATION OF THE EFFECT OF FREE SURFACE REFLECTION ON SHOCK WAVE PROPAGATION IN WATER
M. Kamegai, L. S. Klein, and C. E. Rosenkilde Jul. 1985 7 p refs Presented at the Am. Phys. Soc. Topical Conf. on Shock Waves in Condensed Matter, Spokane, 22 Jul. 1985
(Contract W-7405-eng-48)
(DE85-014807; UCRL-92080; CONF-850736-23) Avail: NTIS HC A02/MF A01

A computer simulation is used to study the behavior of a fluid which has been set into motion by a point explosion below a bounding free surface. Of particular interest is the interaction between the incident shock wave and the reflected rarefaction signal which, under certain conditions, can overtake the shock front. Onset criteria for the envelope which separates the region of irregular from that of regular rarefaction, the nonspherical shape of the shock front, and the pulse profile for several depths of burst covering both strong and weak shock interactions with the surface are discussed. DOE

N86-12564# Sandia National Labs., Albuquerque, N. Mex.
FINNED TUBE CONTACT CONDUCTANCE: CHARACTERIZING THE INTEGRITY OF THE MECHANICAL BOND
T. L. Ernest, J. W. Sheffield, and H. J. Sauer, Jr. 1985 15 p Presented at the Am. Soc. of Heating, Refrig. and Air-Conditioning Eng. Semiann. Meeting, Honolulu, Hawaii, 23 Jun. 1985 Prepared in cooperation with Missouri Univ., Rolla
(Contract DE-AC04-76DP-00789)
(DE85-013747; SAND-85-1440C; CONF-850606-10) Avail: NTIS HC A02/MF A01

Thermal contact conductance of expanded tube joints is dependent upon the interfacial pressure between the mating parts. A review of the literature indicates that very little work has been done towards relating the joint stresses to the dimensional parameters for mechanically expanded plate finned-tube heat exchangers, commonly called fin coils. This paper presents an experimental testing technique to investigate the fin-to-tube mechanical bond based upon the axial pull strength of the joint. Typical coils from two manufacturers were used in this investigation. They were fabricated from 3/8 in. copper tubes and plate aluminum fins. The coils tested had fin spacings of 6, 7, 8, 12, and 20 fins per inch, fin thicknesses of 0.008 and 0.0055 in. Tube thicknesses of 0.015 and 0.016 in. and diametrical interferences of 0.001, 0.006, and 0.010 in. The maximum force attained during a tube pullout was found to be descriptive of the bond. Plots of

this force versus fin number and net interference are presented that illustrate the sensitivity of this force to the fin thickness, fin number, and net interference. These plots show that the fin thickness has the predominant effect on the pullout force and, in turn, the bond between the fin collar and the tube. DOE

N86-12565# Lawrence Livermore National Lab., Calif.
MODELING SHORT PULSE DURATION SHOCK INITIATION OF SOLID EXPLOSIVES
C. M. Tarver, J. O. Hallquist, and L. M. Erickson 27 Jun. 1985 11 p refs Presented at the 8th Intern. Symp. on Detonation, Albuquerque, N. Mex., 15 Jul. 1985
(Contract W-7405-eng-48)
(DE85-014803; UCRL-91484; CONF-850706-25) Avail: NTIS HC A02/MF A01

The chemical reaction rate law in the ignition and growth model of shock initiation and detonation of solid explosives is modified so that the model can accurately simulate short pulse duration shock initiation. The reaction rate law contains three terms to model the ignition of hot spots by shock compression, the slow growth of reaction from these isolated hot spots, and the rapid completion of reaction as the hot spots coalesce. Comparisons for PBX 9404 between calculated and experimental records are presented for the electric gun mylar flyer plate system, the minimum priming charge test, embedded manganin pressure and particle velocity gauges, and VISAR particle velocity measurements for a wide variety of input pressures, rise times and pulse durations. The ignition and growth model is now a fully developed phenomenological tool that can be applied with confidence to almost any hazard, vulnerability or explosive performance problem. DOE

N86-12566# Lawrence Livermore National Lab., Calif.
DISLOCATION KINETICS BEHIND SHEAR SHOCKS
R. B. Stout and G. D. Anderson Jun. 1985 6 p refs Presented at the Am. Phys. Soc. Topical Conf. on Shock Waves in Condensed Matter, Spokane, 22 Jul. 1985
(Contract W-7405-eng-48)
(DE85-014811; UCRL-92255; CONF-850736-24) Avail: NTIS HC A02/MF A01

High velocity oblique impact experiments result in both compression and shear shock waves. Behind the shear shock wave the particle velocity is transverse to the shock front. At large transverse particle velocities, dislocation kinetics can contribute a portion of the velocity. Based on a kinematic and thermodynamic model of dislocation kinetics, an analysis is made of the transverse strain and velocity behind a shear shock. Kinematics of dislocations in transverse motion behind the shock is formulated. A solution is given for an ideal case where the dislocation density function propagates as a pulse behind the shear shock. DOE

N86-12567# Argonne National Lab., Ill.
PARTICLE-WALL INTERACTION AND WALL FRICTION IN GAS-SOLID FLOWS
E. D. Doss, M. G. Srinivasan, and A. C. Raptis 1985 13 p refs Presented at the Intern. Symp. and Workshop on Particulate and Multi-Phase Processes and the 16th Ann. Meeting of the Fine Particle Soc., Miami Beach, Fla., 22 Apr. 1985
(Contract W-31-109-eng-38)
(DE85-014984; CONF-850406-14) Avail: NTIS HC A02/MF A01

Analytical modeling based on one-dimensional two-phase flow for solid-gas suspensions in pipes is the objective of the work described here. The paper focuses on three different empirical correlations based on physical models available for expressing the effect of wall friction on the solid-gas suspension. The three correlations are described and comparisons are made for a typical case of pipe flow. Predictions of pressure drop and particle velocity based on the three models agree well with each other for certain values of empirical parameters. The actual choice of the approach will be made on the basis of experiments to be performed at the Argonne National Laboratory. DOE

N86-12568# Argonne National Lab., Ill.
HEAT EXCHANGER VIBRATION ANALYSIS (HXVA) FOR PREDICTION OF TUBE BUNDLE INSTABILITIES
T. M. Mulcahy, M. W. Wamsganss, and C. I. Yang May 1985 57 p
(Contract W-31-109-eng-38)
(DE85-017144; ANL-85-40) Avail: NTIS HC A04/MF A01

Pre and postprocessors were written for an established hydraulic program (COMMIX-IHX) which enables prediction of the internal crossflow field for each tube of Argonne's Test Heat Exchanger and identification of those tubes most likely to experience fluidelastic instability, together with the instability vibration mode. While the direct use of the HXVA method is limited to single pass, single-segmentally baffled tube bundle configurations, its algorithms and methods can be applied to any type of heat exchanger which can be analyzed by COMMIX-IHX. The processors are explained and an example problem is given along with comparisons of experimental results. DOE

N86-12569# Georgia Inst. of Tech., Atlanta.
DAA MODAL ANALYSIS FOR PARAMETRIC INVESTIGATIONS OF FLUID-STRUCTURE INTERACTION IN UNDERWATER SHOCK, REVISION 1
J. H. Ginsberg and C. E. Rosenkilde Feb. 1985 13 p Presented at the 55th Shock and Vibration Symp., Dayton, Ohio, 23 Oct. 1984 Prepared in cooperation with California Univ., Livermore, Lawrence Livermore Lab.
(Contract W-7405-eng-48)
(DE85-012935; UCRL-91079-Rev-1; CONF-8410159-1-Rev-1) Avail: NTIS HC A02/MF A01

A program was initiated with the goal to develop a simulation of the underwater shock response of submarines. This capability was to be employed for systems analysis studies of a variety of tactical parameters, especially the orientation of the shock wave relative to the structure. Generic analytical models that avoided the details of specific structures, and the number of degrees of freedom was limited by the need for computational efficiency. It is shown how these objectives were met by using the modal expansion version of the doubly asymptotic approximation (DAA). Orthogonal assumed modes for the system are identified as the modes of free vibration for the isolated substructure. Based on these concepts three variants on a basic model are described; each modification provides the capability to evaluate different aspects of the system. The basic model, consists of a rigid cylinder capped by hemispheres which is subjected to a shock wave arriving from an arbitrary leading angle. The REFLECT model extends this fundamental model to treat multiple shock waves associated with reflections from the surface and bottom. The CAPS model was extended to assess the importance of an internal dead load. The new version includes a large internal mass suspended from the cylinder by four springs that give equivalent axial, transverse and rotational suspension stiffnesses. The center of mass of this dead load is located arbitrarily along the axis of symmetry of the cylinder. DOE

N86-12570# Stanford Univ., Calif. Geothermal Program.
VELOCITY AND GRAVITY EFFECTS IN RELATIVE PERMEABILITY MEASUREMENTS
B. A. Beal and C. S. Nunes Jun. 1985 154 p refs
(Contract DE-AT03-80SF-11459)
(DE85-009925; SGP-TR-82) Avail: NTIS HC A08/MF A01

There have been several studies on the effects of gravity and flowrate on laboratory relative permeability measurements. Most of these studies have concentrated on the effect of these parameters on the flooding front. Miller's (1983) data showed that the influence of these and other variables are not understood. The study found that the calculated recovery at breakthrough was different than the observed recovery at breakthrough. The calculated recovery at breakthrough was based on theory derived from Buckley-Leverett piston-like displacement. This study attempted to determine how gravity or core positioning and flowrate of the displacing fluid might be used to achieve a stable flooding front. A relative permeameter with unsteady-state flow was used

for the apparatus. The core material was an unconsolidated silica sand. It is found that gravity has no significant effect on the difference between calculated and observed recovery at breakthrough. It is also observed that an increase in flowrate could increase the flooding front instabilities. Therefore as flowrate decreased the calculated and observed breakthrough approach a single value. DOE

N86-12571# Argonne National Lab., Ill.
CONDENSATION HEAT TRANSFER IN PLATE HEAT EXCHANGERS
C. B. Panchal May 1985 9 p Presented at the Natl. Heat. Transfer Conf., Denver, Aug. 1985
(Contract W-31-109-eng-38)
(DE85-012369; CONF-850810-19) Avail: NTIS HC A02/MF A01

An Alfa-Laval plate heat exchanger, previously tested as an evaporator, was retested as a condenser. Two series of tests with different chevron-angle plates were carried out using ammonia as a working fluid. The overall heat transfer coefficient and pressure drop were measured, and the effects of operating parameters were determined. The experimental data were compared with theoretical predictions. In the analysis, a gravity-controlled condensation process was modeled theoretically, and the overall performance was calculated. The analysis shows that the overall heat transfer coefficient can be predicted with an average uncertainty of about 10%. It is, however, important to consider the interfacial shear stress, because the effective friction factor is high for flow in plate heat exchangers. DOE

N86-12572# University of Northern Arizona, Flagstaff.
REFRIG-12: A GRAPHICS-AUGMENTED INTERACTIVE PROGRAM FOR DESIGNING VAPOR-COMPRESSION REFRIGERATION/HEAT PUMP CYCLES
B. W. Davis 7 Sep. 1984 103 p Prepared in cooperation with California Univ., Livermore. Lawrence Livermore Lab.
(Contract W-7405-eng-48)
(DE85-014205; UCID-30200-83-6) Avail: NTIS HC A06/MF A01

REFRIG-12 is an interactive program that serves as a tool for designing and analyzing thermodynamic vapor compression refrigeration/heatpump cycles. Graphic and alphanumeric responses to design decisions are displayed simultaneously on separate monitors. Temperature-Entropy property coordinates are used to describe the thermodynamic processes Freon-12 undergoes as it passes through the various mechanical components which ultimately produce the cycle. The processes are displayed graphically as the user makes the decisions to design a refrigeration cycle. When a design has been completed, REFRIG-12 offers the user an opportunity to make changes. The effects of design changes become graphically discernible through successive overlays on the graphics monitor. DOTPLOT can be executed to produce a hard copy of the graphics monitor display. Summaries of the cycle performance, pertinent energy transfers, and other engineering consequences of the design specifications can also be presented - at user option - on both the CRT and the printer. REFRIG-12 is organized so that a relatively small main program controls 25 subroutines. Each subroutine has stand alone characteristics and may be used with programs having other primary purposes. The subroutines can be conveniently merged (or chained) into system memory as needed. DOE

N86-12573# Science Applications, Inc., Sunnyvale, Calif.
DEVELOPMENT OF A CONTINUOUS MASS FLOW MEASURING FLOW Quarterly Report, Jan. - Mar. 1984
Jun. 1985 17 p
(Contract DE-AC22-81PC-40022)
(DE85-012492; DOE/PC-40022/T3) Avail: NTIS HC A02/MF A01

Source effectiveness and geometry studies are performed in order to prepare to measure the performance of a mass flow meter by the count rate of activated oxygen detected downstream. Several neutron sources are considered for the purpose. Shielding problems were investigated. Heat transfer calculations were performed to evaluate the duty of a refrigeration unit that will be required to maintain the neutron source at its optimum operating temperature. A densitometer source and shielding has been sized. DOE

N86-12574# Oak Ridge National Lab., Tenn.
INFLUENCE OF A SURFACTANT ADDITIVE ON ABSORPTION HEAT PUMP PERFORMANCE
J. W. Michel and H. perez-Blanco 1985 16 p refs Presented at the Am. Soc. of Heating, Refrig. and Air-Conditioning Eng. Semiann. Meeting, Honolulu, Hawaii, 23 Jun. 1985
(Contract DE-AC05-84OR-21400)
(DE85-013995; CONF-850606-11) Avail: NTIS HC A02/MF A01

Surfactant additives have been known for some time to influence the boiling characteristics of water and water-salt solutions. An enhancement of boiling transfer coefficients can be obtained by a proper choice of additives. When the capacity of an absorption heat pump is limited by its generator capacity and the generator is of the boiling-pool type, it is possible to increase the machine capacity by means of surfactant addition. In this paper, the preliminary experiments leading to the selection of a surfactant for a lithium bromide-water absorption heat pump are described. Minimum foaming was the most important consideration in this selection process. The measured machine performance shows that the generator capacity may be increased by values ranging from 5% to 10% of the original capacity. The actual value depends on the operating conditions as given by solution concentration, flow rate, and temperatures. DOE

N86-12575# Pittsburgh Univ., Pa. Dept. of Physics and Astronomy.
FLUID PHYSICS RESEARCH Progress Report, 1 Aug. 1985 - 30 Jun. 1985
J. V. Maher 25 Jun. 1985 10 p
(Contract DE-FG02-84ER-45131)
(DE85-014644; DOE/ER-45131/T1) Avail: NTIS HC A02/MF A01

Research is reported for three areas: Hele-Shaw flow; search for instability on a quenched liquid interface; and binary liquid gels. DOE

N86-12576# Argonne National Lab., Ill.
ANALYSIS OF STRATIFIED FLOW MIXING
S. L. Soo and R. W. Lyczkowski 1985 25 p refs Presented at the Natl. Heat Transfer Conf., Denver, 4 Aug. 1985
(Contract W-7405-eng-38)
(DE85-006840; CONF-850810-7) Avail: NTIS HC A02/MF A01

The Creare 1/5-scale Phase II experiments which model fluid and thermal mixing of relatively cold high pressure injection (PHI) water into a cold leg of a full-scale pressurized water reactor (PWR) having loop flow are analyzed and found that they cannot achieve complete similarity with respect to characteristic Reynolds and Froude numbers and developing hydrodynamic entry length. Several analyses show that these experiments fall into two distinct regimes of mixing: momentum controlled and gravity controlled (stratification). DOE

N86-12577# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
ISOTHERMAL DEHUMIDIFICATION OF AIR IN A PARALLEL PASSAGE CONFIGURATION
A. A. Pesaran and F. Zangrando Jun. 1985 12 p Presented at the Natl. Heat Transfer Conf., Denver, 4 Aug. 1985
(Contract DE-AC02-83CH-10093)
(DE85-008819; SERI/TP-252-2630; CONF-850810-23) Avail: NTIS HC A02/MF A01

The performance of a single parallel passage of a dehumidifier was examined under isothermal conditions both experimentally and theoretically. The passage was coated with silica gel using a polyester tape. The transient response of the silica gel test cells to a step change in air inlet humidity was obtained experimentally and compared with the predictions of a pseudo-gas-side-controlled mass transfer model. The transient response of the test cell depended on the air flow rate, aspect ratio, and temperature.

Although the general trend of the experimental and predicted results were similar, the comparisons were not satisfactory. The observed discrepancies were attributed to the uncertainties in the pseudo-gas-side mass transfer coefficient and equilibrium isotherm. DOE

N86-12578# California Univ., Berkeley. Lawrence Berkeley Lab.
STUDY OF TWO-PHASE CONCURRENT FLOW OF STEAM AND WATER IN AN UNCONSOLIDATED POROUS MEDIUM
A. K. Verma, K. Pruess, C. F. Tsang, and P. A. Witherspoon Apr. 1985 11 p refs Presented at the Natl. Heat Transfer Conf., Denver, 4 Aug. 1985
(Contract DE-AC03-76SF-00098)
(DE85-014534; LBL-19084; CONF-850810-21) Avail: NTIS HC A02/MF A01

A combined experimental and numerical study of two-phase steam/water flow in porous media was carried out. An experiment consisting of steady state, two-phase concurrent flow of steam and water was conducted to obtain a set of relative permeability and capillary pressure curves. The experimental relative permeability and the capillary pressure curves were included in a numerical code, MULKOM, and the experiment was simulated. A good agreement between the numerical results and the experimental data was found, thus confirming the results. Upon comparing these results with gas/oil and oil/water relative permeabilities obtained by other investigators, it was found that while the wetting phase relative permeabilities in all cases are about the same, the vapor phase relative permeability is larger than the non-wetting phase relative permeabilities in gas/oil or oil/water flows. It is suggested that the phenomenon of enhanced vapor phase relative permeability is caused by channeling and/or phase transformation effects. DOE

N86-12397# Joint Publications Research Service, Arlington, Va.
NUMERICAL COMPUTATION OF FULL THREE-DIMENSIONAL FLOW IN TRANSONIC TURBINES
Shen Mengyu and Zhang Yaoke *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-016) 23 May 1985 p 73-77 refs Transl. into ENGLISH from Shuzhi Jisuan yu Jisuanji Yingyong (Beijing), no. 2, Jun. 1984 p 125-128 (For primary document see N86-12393 03-31)
Avail: NTIS HC A08/MF A01

N86-12398# Joint Publications Research Service, Arlington, Va.
CODE OF FINITE ELEMENT ANALYSIS FOR THREE-DIMENSIONAL FLOW IN TURBOMACHINES
Huang Aixiang *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-016) 23 May 1985 p 78-91 refs Transl. into ENGLISH from Shuzhi Jisuan yu Jisuanji Yingyong (Beijing), no. 1, Mar. 1984 p 38-47 (For primary document see N86-12393 03-31)
Avail: NTIS HC A08/MF A01

N86-12426# Joint Publications Research Service, Arlington, Va.
SUPERHEATED STEAM'S DENSITY COMPENSATION FOR FLOW MEASUREMENT
Xu Guanquan *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-021) 8 Jul. 1985 p 123-128 refs Transl. into ENGLISH from Huaxue Shijie (Shanghai), v. 26, no. 2, 20 Feb. 1985 p 61-63 (For primary document see N86-12421 03-31)
Avail: NTIS HC A09/MF A01

N86-12660# Joint Publications Research Service, Arlington, Va.
DIFFRACTION OF INTERNAL WAVES DESCRIBED BY EQUATION OF SLIGHTLY STRATIFIED FLUID ON HALF-PLANE Abstract Only
A. T. Ismail-Zade *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 27-28 Transl. into ENGLISH from Izv. Akad. Nauk Azerb. SSR, Ser. Nauk o Zemle (USSR), no. 5, 1984 p 76-83 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

N86-12669# Joint Publications Research Service, Arlington, Va.
THEORY OF SOLITARY ANTICYCLONES IN ROTATING FLUID Abstract Only
G. G. Sutyrin *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 38 Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 280, no. 5, Feb. 1985 p 1101-1105 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

N86-12671# Joint Publications Research Service, Arlington, Va.
LABORATORY STUDY OF REGULAR LOW-AMPLITUDE GRAVITY CAPILLARY WAVES IN NONSTATIONARY CURRENT Abstract Only
Ye. S. Benilov, K. V. Pokazeyev, and A. D. Rozenberg *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 39-40 Transl. into ENGLISH from Okeanol. (Moscow), v. 25, No. 1, Jan. - Feb. 1985 p 37-42 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

N86-12673# Joint Publications Research Service, Arlington, Va.
STUDY OF INFLUENCE OF VERTICAL VELOCITY AND DENSITY PROFILES ON HYDRODYNAMIC STABILITY OF ZONAL FLOW Abstract Only
A. S Blatov and V. I. Ulyanova *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 41 Transl. into ENGLISH from Okeanol. (Moscow), v. 25, no. 1, Jan. - Feb. 1985 p 19-25 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

35 INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography.

For aerial photography see *43 Earth Resources.* For related information see also *06 Aircraft Instrumentation,* and *19 Spacecraft Instrumentation.*

N86-12579*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
RAPID ESTIMATION OF FREQUENCY RESPONSE FUNCTIONS BY CLOSE-RANGE PHOTOGRAMMETRY
John S. Tripp Nov. 1985 30 p refs
(NASA-TP-2471; L-15955; NAS 1.60:2471) Avail: NTIS HC A03/MF A01 CSCL 14E

The accuracy of a rapid method which estimates the frequency response function from stereoscopic dynamic data is computed. It is shown that reversal of the order of the operations of coordinate transformation and Fourier transformation, which provides a significant increase in computational speed, introduces error. A portion of the error, proportional to the perturbation components normal to the camera focal planes, cannot be eliminated. The remaining error may be eliminated by proper scaling of frequency data prior to coordinate transformation. Methods are developed for least square estimation of the full 3x3 frequency response matrix for a three dimensional structure. Author

N86-12580*# Spectron Development Labs., Inc., Costa Mesa, Calif.
OPTICAL TECHNIQUE TO STUDY THE IMPACT OF HEAVY RAIN ON AIRCRAFT PERFORMANCE Final Report
Cecil F. Hess and Funming Li Oct. 1985 43 p refs
(Contract NAS1-17932)
(NASA-CR-177989; NAS 1.26:177989; SDL-85-2424-1F) Avail: NTIS HC A03/MF A01 CSCL 01C

A laser based technique was investigated and shown to have the potential to obtain measurements of the size and velocity of water droplets used in a wind tunnel to simulate rain. A theoretical model was developed which included some simple effects due to droplet nonsphericity. Parametric studies included the variation of collection distance (up to 4 m), angle of collection, effect of beam interference by the spray, and droplet shape. Accurate measurements were obtained under extremely high liquid water content

and spray interference. The technique finds applications in the characterization of two phase flows where the size and velocity of particles are needed. Author

N86-12581# Department of the Navy, Washington, D. C.
TECHNIQUE FOR THE REDUCTION OF FADING IN INTERFEROMETERS Patent Application
N. J. Frigo, A. Dandridge, and A. B. Tveten, inventors (to Navy) Filed 12 Apr. 1985 12 p
(AD-D011845; US-Patent-Appl-SN-722580) Avail: NTIS HC A02/MF A01 CSCL 17/8

This patent application discloses a passive device for reducing polarization fading in interferometers without significantly degrading the signal-to-noise ratio. In one embodiment, light form an interferometer output is passed through a lens to a polarization mask. The polarization mask comprises at least three independent polarizers which pass independent states of polarizers. Each independently polarized signal is detected, demodulated and passed to a means for signal extraction. GRA

N86-12582# Automated Sciences Group, Inc., Silver Spring, Md.
OPTICAL DISK TECHNOLOGY ASSESSMENT
Jun. 1985 126 p
(Contract MDA903-84-C-0197)
(AD-A157909; ASG-TR-189-17R) Avail: NTIS HC A07/MF A01 CSCL 14/3

This report provides findings and recommendations of a technical assessment which was completed in March 1985. The primary objective was to evaluate the current state-of-the-art and feasibility of using optical disks to support future applications developed by the Office of the Secretary of Defense. The technical Assessment report contains: Section 2: Study scope, terminology, and introduction; Section 3: Management and Technical Summary; Section 4 to 6: Optical disk technology assessment details; Section 7: Conclusions and recommendations; Glossary and Bibliography. The optical disk offers the same potential as the micro-computer to impact automation of information and is an excellent random storage medium for almost any type of permanent image data. The technology is based on the use of a laser to burn (record) holes in the light sensitive surface of an optical or plastic coated disk. The disks are manufactured in different sizes with 12-in, 5.25-in, and 4.75-in, diameter disks being the most common. The 12-1n. disk has a storage capacity of two billion bytes of data when recorded on both sides. GRA

N86-12583# Royal Signals and Radar Establishment, Malvern (England).
THE THEORY AND PRACTICE OF A MULTISTATE REFLECTOMETER
J. P. Ide and L. C. Oldfield Jan. 1985 32 p
(AD-A157916; RSRE-MEMO-3824; DRIC-BR-96368) Avail: NTIS HC A03/MF A01 CSCL 14/2

This Memorandum details the way a multistate reflectometer is used to measure the reflection coefficient of waveguide devices. It contains theoretical derivations of the equations and a computer program, with explanatory notes, for solving them. The calibration procedure is also given. These techniques are suitable for all frequency bands and transmission media where suitable standards and detectors exist. Author (GRA)

N86-12584# Department of the Army, Washington, D. C.
ELECTROLYTIC PRESSURE TRANSDUCTION SYSTEM Patent Application
G. H. Bryant, inventor (to Army) Filed 3 Oct. 1984 15 p
(AD-D011847; US-Patent-Appl-SN-657438) Avail: NTIS HC A02/MF A01 CSCL 14/2

This invention is directed to a Wheatstone bridge circuit for measuring pressure in the distal esophageal sphincter (D.E.S.) as well as in other organs and bodily cavities. A flexible hollow tube having three spaced electrodes is lodged in the esophagus. The tube is partly filled with a saline solution to cover the electrodes, thereby producing two series connected, pressure sensitive resistors. The electrolytic resistors are coupled to two series connected fixed resistors to complete the bridge circuit. Electrical imbalances in the bridge circuit are measured in terms of the pressure corresponding to the pressure applied by the D.E.S. Author (GRA)

N86-12585# Department of the Air Force, Washington, D.C.
TRANSIENT TEST OF SUSPENSION ELECTRONICS FOR GYROSCOPE Patent Application
P. H. Ito, inventor (to Air Force) Filed 8 Jul. 1985 48 p
(AD-D011853; US-Patent-Appl-SN-752767) Avail: NTIS HC A03/MF A01 CSCL 17/7

The rotor suspension electronics of an electrostatic gyro suspension system is required to perform flawlessly to sustain the life of the gyro. Transient abnormalities as short as one millisecond duration will cause the spinning rotor to come in contact with the surrounding electrodes and result in destruction of the gyro. Thus, not infrequently after a catastrophic dropped rotor incident no trace of the fault is evident upon ensuing check of the system. To remedy this problem a built in test (BIT) system is used to provide fault isolation. The test circuitry is built into the navigation system electronics and integrated with the system program. The fault isolation electronics comprise sensor circuits to monitor functional subdivisions of the electronic suspension system for signal abnormality and a processing circuit which receives the sensor circuit outputs and identifies the primary source of the fault. The faults are detected and the source is flagged at the time of occurrance. The output of the fault isolation electronics is a latched coded readout which is fed to the navigation computer for memory storage and any appropriate follow-up system action, such as power shutdown. After initialization by the computer, the fault isolation function is an automatic operation by the electronic circuitry. Author (GRA)

N86-12586# Los Alamos National Lab., N. Mex.
LOS ALAMOS CONSTANT-Q SPECTROMETER
R. A. Robinson, R. Pynn, J. Eckert, and J. A. Goldstone 1985 16 p refs Presented at the 8th Meeting of Intern. Collaboration on Advan. Neutron Sources, Oxford, 7 Jul. 1985
(Contract W-7405-eng-36)
(DE85-014115; LA-UR-85-2070; CONF-850762-1) Avail: NTIS HC A02/MF A01

A constant-Q spectrometer, which has been installed on the pulsed source of the Los Alamos Neutron Scattering Center, is described. It features a number of innovations that ease sample and analyzer alignment and a novel composite crystal analyzer which exploits the mosaic properties of plastically deformed germanium in a new way. Observations of phonon dispersion in aluminum and of incoherent scattering in ZrH2 are reported, along with background measurements. DOE

N86-12587# Lawrence Livermore National Lab., Calif.
IMPROVED APPROACH TO CHARACTERIZING AND PRESENTING STREAK CAMERA PERFORMANCE
j. D. Wiedwald and B. A. Jones 15 Jul. 1985 7 p Presented at the SPIE Intern. Tech. Symp. on Optical and Elec.-Optical Eng., San Diego, Calif., 18 Aug. 1985
(Contract W-7405-eng-48)
(DE85-015188; UCRL-92160; CONF-850887-8) Avail: NTIS HC A02/MF A01

The performance of a streak camera recording system is strongly linked to the technique used to amplify, detect and quantify the streaked image. At the Lawrence Livermore National Laboratory (LLNL) streak camera images have been recorded both on film and by fiber-optically coupling to charge-coupled devices (CCD's). During the development of a new process for recording these images (lens coupling the image onto a cooled CCD) the definitions of important performance characteristics such as resolution and dynamic range are re-examined. As a result of this development, these performance characteristics are now presented to the streak camera user in a more useful format than in the past. This paper describes how these techniques are used within the Laser Fusion Program at LLNL. The system resolution is presented as a modulation transfer function, including the seldom reported effects

that flare and light scattering have at low spatial frequencies. Data are presented such that a user can adjust intensifier gain and pixel averaging to optimize the useful dynamic range in any particular application. DOE

N86-12588# Oak Ridge Y-12 Plant, Tenn.
PRECISION ION VACUUM GAGE WITH LOGARITHMIC RESPONSE
M. G. Duncan 28 Jun. 1985 81 p
(Contract DE-AC05-84OS-21400)
(DE85-015312; Y-2343) Avail: NTIS HC A05/MF A01

A new ion vacuum gage controller has been developed of use with Bayard-Alpert gage tubes. The instrument employs a logarithmic-gain electrometer to cover up to 12 decades of pressure without the gain range changing. Instrument error and repeatability is + or - 1% of the pressure reading over a 9-decade pressure range with an ideal Bayard-Alpert gage tube. The instrument also offers selectable autoranging of fixed emission-current control. Furthermore, protection circuits and a computer interface are provided. DOE

N86-12589# Los Alamos Scientific Lab., N. Mex.
NOVEL INSTRUMENT FOR HIGH-PRESSURE RESEARCH AT ULTRA-HIGH TEMPERATURES
D. Schiferl, A. I. Katz, R. L. Mills, L. C. Schmidt, C. Vanderborgh, E. F. Skelton, W. T. Elam, A. W. Webb, S. B. Qadri, and M. Schaefer 1985 8 p refs Presented at the 10th High Pressure Conf. on Res. in High Pressure Sci. and Technol., Amsterdam, 8 Jul. 1985 Prepared in cooperation with NRC, Washington, D.C., Sachs/Freeman Associates, Inc., Bowie, Md. and Carnegie Institution of Washington, D.C.
(Contract W-7405-eng-36)
(DE85-015674; LA-UR-85-2362; CONF-850759-9) Avail: NTIS HC A02/MF A01

A resistively heated diamond-anvil cell has been used to achieve pressures of 110 kbar at temperatures exceeding 1200 C for periods long enough to collect X-ray powder diffraction data with energy-dispersive techniques using white X-radiation produced at the Stanford Synchrotron Radiation Laboratory. DOE

N86-12590# Sandia National Labs., Albuquerque, N. Mex.
STUDIES OF THE BAUER PIEZOELECTRIC POLYMER GAUGE (PVF2) UNDER IMPACT LOADING
L. M. Lee, W. D. Williams, R. A. Graham, and F. Bauer 1985 11 p Presented at the Am. Phys. Soc. Topical Conf. on Shock Waves in Condensed Matter, Spokane, 22 Jul. 1985 Prepared in cooperation with Ktech Corp., Albuquerque, N. Mex. and Institut Franco-Allemand de Recherches, St. Louis, France
(Contract DE-AC04-76DP-00789)
(DE85-014707; SAND-85-0415C; CONF-850736-34) Avail: NTIS HC A02/MF A01

A cooperative program has been initiated to provide a highly reproducible PVF2 polymer film for widespread use as a gauge under shock-compression loading. The material source and electrical treatment are based on prior work but new, independent studies of gauge response are being carried out. First measurements indicate excellent agreement between the independent studies. DOE

N86-12591# Lawrence Livermore National Lab., Calif.
RESULTS OF PRIM GYROSCOPE TESTING
R. Cornell Mar. 1985 11 p Presented at the 17th Ballistics Working Group Meeting, Livermore, Calif., 17 Oct. 1984
(Contract W-7405-eng-48)
(DE85-012934; UCRL-92356; CONF-8410277-1) Avail: NTIS HC A02/MF A01

The tests were designed so that motions of the gyroscope and the partially restrained internal member (PRIM) could be measured at different conditions of spin and PRIM clearance gaps. Two types of PRIM drive were tested. A round shaft configuration was used to test theory. An octagon drive was used to simulate the XM785 design. DOE

N86-12592# Lawrence Livermore National Lab., Calif.
MEASUREMENT OF TRITIUM PERMEATION THROUGH RESISTANT MATERIALS NEAR ROOM TEMPERATURE
J. Maienschein, V. DuVal, F. McMurphy, F. Uribe, R. Musket, and D. Brown 1985 8 p refs Presented at the 2nd Natl. Topical Meeting on Tritium Technol. in Fission, Fusion and Isotopic Appl., Dayton, Ohio, 30 Apr. 1985
(Contract W-7405-eng-48)
(DE85-012942; UCRL-91469; CONF-850405-12) Avail: NTIS HC A02/MF A01

To measure tritium permeation through low permeability materials at 50 to 170 C, we use highly sensitive liquid scintillation counting to detect the permeating tritium. To validate the method, extensive experiments with copper, for which such data exists for comparison were conducted and details of the experimental technique. Further plans are outlined. DOE

N86-12593# Lawrence Livermore National Lab., Calif.
X-RAY DIFFRACTION CELL FOR DEBYE-SCHERRER AND GUINIER (HUBER) CAMERAS AT PRESSURE AND TEMPERATURE
J. F. Lakner 25 Jun. 1985 12 p refs Presented at the 10th High Pressure Conf. on Res. in High Pressure Sci. and Technol., Amsterdam, 8 Jul. 1985
(Contract W-7405-eng-48)
(DE85-014815; UCRL-91872; CONF-850759-7) Avail: NTIS HC A02/MF A01

A gas high pressure cell for X-ray diffraction studies was developed. It is capable of 2700 atm hydrogen pressure at ambient temperature, when used in a Debye-Scherrer camera, and 1020 atm to at least 300(0)C, when used in a Guinier (Huber) camera. It is suitable for weakly scattering materials. DOE

N86-12594# KMS Fusion, Inc., Ann Arbor, Mich.
RECENT DEVELOPMENTS IN MICROSHELL-TIPPED OPTICAL FIBERS AS HIGH-PRESSURE SHOCK DETECTORS
F. J. Mayer, R. L. Maynard, D. L. Musinski, N. W. Schmerberg, M. R. Wixom, and R. F. Benjamin 1985 7 p refs Presented at the Am. Phys. Soc. Topical Conf. on Shock Waves in Condensed Matter, Spokane, 22 Jul. 1985 Prepared in cooperation with Los Alamos National Lab., Albuquerque, N. Mex.
(Contract W-7405-eng-36)
(DE85-015750; LA-UR-85-2479; CONF-850736-48) Avail: NTIS HC A02/MF A01

We describe ongoing development and characterization of Microshell-tipped optical fibers used as impact sensors. We observed a risetime of 15 ns when the probe is used to measure a detonation wave in PETN. We report successful development of two nondestructive tests, radiography and fluorescence, to check the integrity of the sensor. The sensor is now commercially available. DOE

N86-12595# Sandia National Labs., Albuquerque, N. Mex.
NEW PASSIVE HELICOPTER DETECTOR
G. R. Elliott 1985 7 p Presented at the 26th Ann. Meeting of the Inst. of Nucl. Mater. Management, Albuquerque, N. Mex., 21; Jul. 1985
(Contract DE-AC04-76DP-00789)
(DE85-015160; SAND-85-1670C; CONF-850765-9) Avail: NTIS HC A02/MF A01

Sandia has developed a new helicopter detector. The device relies on the correlation between the acoustic wave from the helicopter and the resulting coupled seismic wave. A significant feature of this approach is that the detector is completely passive; there is no radio frequency radiation. Intended for deployment as a perimeter sensor around a site, the unit offers a low nuisance/false alarm rate and a high probability of detection for a wide range of helicopters. Reliable detection occurs when the target is at high altitude and also very near the earth's surface. Detection ranges start at one kilometer for the small, four-place, civilian helicopter and approach five kilometers for heavier, military types. The system has two parts: a transducer package containing a micrphone and a geophone and a digital processor. Development

is underway for a model which will be AC powered and well suited to permanent facilities. A prototype unit using a lightweight, battery powered processor is being constructed for rapid-deployment applications. DOE

N86-12596# Oak Ridge National Lab., Tenn.
DROPLET FORMATION PHENOMENA IN dc ELECTRICAL FIELDS
R. A. Malinauskas and C. H. Byers Jul. 1985 80 p refs
(Contract DE-AC05-84OR-21400)
(DE85-014067; ORNL/TM-9446) Avail: NTIS HC A05/MF A01

A new method of photographing and analyzing data from pendant drops was studied. This new method included using high-speed video equipment and a digitized analyzer to evaluate data in terms of the surface tensions of drops. Experimentation on pendant drops of two different systems, water-air and water-cyclohexane, was conducted in establishing this photographic technique. The most common method of evaluating pendant drops was analyzed in helping to construct a new computer program which solves for the actual Laplacian curve and surface tension of a surface by means of a curve-fitting regression analysis. The preliminary theory and applications described in this paper led to a recommendation using the proposed analytical methods on extended experiments in this project on mass transfer of liquids and droplet formation phenomena as a function of imposed electric fields. DOE

N86-12373# Fuji Electric Co. Ltd., Yokosuka (Japan).
DISSOCIATIVE VOLUME RECOMBINATION COEFFICIENT MEASUREMENTS IN A SUBROOM TEMPERATURE NEON PLASMA AFTERGLOW
K. Keskinen, Y. Ichikawa, R. M. Hobson (York Univ., Toronto), H. Fukuda (Sony Co. Ltd., Tokyo), S. Teii (Musashi Inst. of Tech., Tokyo), T. Kaneda (Tokyo Denki Univ.), and J. S. Chang (McMaster Univ.) *In* Tokyo Denki Univ. Res. Rept. of the Faculty of Eng., Tokyo Denki Univ., No. 32 Dec. 1984 p 1-11 refs Sponsored in part by the Natural Sciences and Engineering Research Council of Canada (For primary document see N86-12372 03-31)
Avail: NTIS HC A09/MF A01

N86-12384# Tohoku Univ., Sendai (Japan). Research Inst. of Electrical Communication.
PROPOSAL OF A HIGH EFFICIENT AND HIGH POWER PENIOTRON
Nobuyuki Sato, Mohamad Razeghi, Takehisa Suzuki, Kuniyoshi Yokoo, and Shoichi Ono *In its* The Record of Elec. and Commun. Eng. Conversazione, Vol. 54, No. 1 Aug. 1985 p 1-8 refs In JAPANESE; ENGLISH summary (For primary document see N86-12383 03-31)
Avail: NTIS HC A03/MF A01

N86-12411# Joint Publications Research Service, Arlington, Va.
LASER ANEMOMETER USING A SINGLE CIRCUIT BOARD
Gu Weiyu, Han Shouchun, Song Zhengfang, Liu Xiaochun, Ding Qiang, and Qi Fudi *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-017) 11 Jun. 1985 p 78-85 Transl. into ENGLISH from Weijisuanji Yingyong (Beijing), no. 4, Nov. 1984 p 48-51 (For primary document see N86-12408 03-31)
Avail: NTIS HC A08/MF A01

N86-12438# Joint Publications Research Service, Arlington, Va.
ULTRAHIGH VACUUM EQUIPMENT DESCRIBED
Li Yuzhi, Jing Shiqun, and Peng Xianhui *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-034) 1 Oct. 1985 p 87-91 Transl. into ENGLISH from Diwen Wuli (Beijing), v. 7, no. 2, Jun. 1985 p 166-168 (For primary document see N86-12430 03-31)
Avail: NTIS HC A08/MF A01

N86-12440# Joint Publications Research Service, Arlington, Va.
CHINA'S FIRST IMPORTED PERIPHERAL EQUIPMENT PRODUCTION LINE
In its China Rept.: Sci. and Technol. (JPRS-CST-85-022) 11 Jul. 1985 p 17-25 Transl. into ENGLISH from Jisuanji Shijie (Beijing), no. 11, 8 Jun. 1984 p 1 (For primary document see N86-12439 03-31)
Avail: NTIS HC A09/MF A01

N86-12441# Joint Publications Research Service, Arlington, Va.
METHOD OF USING CTC TO MICROCOMPUTERIZE DIGITAL INSTRUMENTS
Wu Naiyou *In its* China Rept.: Sci. and Technol. 11 Jul. 1985 p 26-31 Transl. into ENGLISH from Dianzi Kexue Jishu (Beijing), v. 15, no. 1, 10 Jan. 1985 p 5-6 (For primary document see N86-12439 03-31)
Avail: NTIS HC A09/MF A01

N86-12442# Joint Publications Research Service, Arlington, Va.
DIGITAL PHASE METER USING CMOS-LED INTRODUCED
Tan Benzhi *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-022) 11 Jul. 1985 p 32-34 Transl. into ENGLISH from Dianzi Kexue Jishu (Beijing), v. 15, no. 1, 10 Jan. 1985 p 25 and 28 (For primary document see N86-12439 03-31)
Avail: NTIS HC A09/MF A01

N86-12449# Joint Publications Research Service, Arlington, Va.
DIGITAL VOLTMETER TECHNOLOGY ACQUISITION
Chen Qilin and Cui Jianping *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-029) 3 Sep. 1985 p 41-44 Transl. into ENGLISH from Guoji Maoyi (Beijing), no. 3, 1985 p 33-34 (For primary document see N86-12446 03-31)
Avail: NTIS HC A08/MF A01

N86-12688# Joint Publications Research Service, Arlington, Va.
VIDEO TERMINAL FOR ANALYZING AERIAL INFRARED PHOTOGRAPHS Abstract Only
In its USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 72 Transl. into ENGLISH from NTR: Probl. i Resheniya (Moscow), 5-18 Mar. 1985 p 2 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

N86-13242*# Augsburg Univ. (West Germany). Dept. of Physics.
AE AND DE MASS SPECTROMETER OBSERVATIONS RELEVANT TO THE SHUTTLE GLOW
Mark J. Engebretson *In* NASA. Marshall Space Flight Center 2d Workshop on Spacecraft Glow Sep. 1985 p 46-54 refs (For primary document see N86-13239 03-88)
(Grant NAG5-349)
Avail: NTIS HC A13/MF A01 CSCL 03B

N86-13244*# National Research Council of Canada, Ottawa (Ontario). Inst. of Astrophysics.
ORBITER GLOW OBSERVATIONS AT HIGH SPECTRAL RESOLUTION
David J. W. Kendall, Richard L. Gattinger, Edward J. Llewellyn (Saskatchewan Univ.), Ian C. McDade (Saskatchewan Univ.), and Steven B. Mende (LMSC, Palo Alto, Calif.) *In* NASA. Marshall Space Flight Center 2d Workshop on Spacecraft Glow Sep. 1985 p 63-73 refs Sponsored in part by the Universities Space Research Association. (For primary document see N86-13239 03-88)
Avail: NTIS HC A13/MF A01 CSCL 03B

N86-13245*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
NEUTRAL MASS SPECTROMETER MEASUREMENTS IN THE SHUTTLE BAY ENVIRONMENT
E. Miller and G. Carignan (Michigan Univ.) *In its* 2d Workshop on Spacecraft Glow Sep. 1985 p 74-81 refs (For primary document see N86-13239 03-88)
Avail: NTIS HC A13/MF A01 CSCL 03B

N86-13247*# Utah State Univ., Logan. Dept. of Physics.
THE UV-VIS OPTICAL ENVIRONMENT OF THE SHUTTLE
Marsha R. Torr *In* NASA. Marshall Space Flight Center 2d Workshop on Spacecraft Glow Sep. 1985 p 98-106 refs (For primary document see N86-13239 03-88)

(Contract NAS8-33992)
Avail: NTIS HC A13/MF A01

N86-13248*# Utah State Univ., Logan. Dept. of Physics.
ENHANCED N(+) SUB 2 IN THE SHUTTLE ENVIRONMENT Abstract Only
Doug G. Torr, A. Khoyloo, and Marsha R. Torr *In* NASA. Marshall Space Flight Center 2d Workshop on Spacecraft Glow Sep. 1985 p 107 (For primary document see N86-13239 03-88)
Avail: NTIS HC A13/MF A01 CSCL 03B

N86-13249*# California Univ., Berkeley. Space Sciences Lab.
INVESTIGATION OF VEHICLE GLOW IN THE FAR ULTRAVIOLET
Supiya Chakrabarti and Timothy Sassen *In* NASA. Marshall Space Flight Center 2d Workshop on Spacecraft Glow Sep. 1985 p 108-115 refs (For primary document see N86-13239 03-88)
(Contract NAS8-32577)
Avail: NTIS HC A13/MF A01 CSCL 03B

N86-13257*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
THE PRODUCTION OF GLOW PRECURSORS BY OXIDATIVE EROSION OF SPACECRAFT SURFACES
John C. Gregory (Alabama Univ., Huntsville) and Palmer N. Peters *In its* 2d Workshop on Spacecraft Glow Sep. 1985 p 174-179 refs (For primary document see N86-13239 03-88)
(Contract NAS8-36189)
Avail: NTIS HC A13/MF A01 CSCL 03B

N86-13259*# Vanderbilt Univ., Nashville, Tenn. Dept. of Physics and Astronomy.
OPTICAL RADIATION FROM THE INTERACTION OF ENERGETIC ATOMS, IONS, ELECTRONS, AND PHOTONS WITH SURFACES
N. H. Tolk, R. G. Albridge, R. F. Haglund, Jr., and M. H. Mendenhall *In* NASA. Marshall Space Flight Center 2d Workshop on Spacecraft Glow Sep. 1985 p 191-201 refs (For primary document see N86-13239 03-88)
Avail: NTIS HC A13/MF A01 CSCL 03B

N86-13260*# Princeton Univ., N. J. Plasma Physics Lab.
A GROUND-BASED EXPERIMENTAL TEST PROGRAM TO DUPLICATE AND STUDY THE SPACECRAFT GLOW PHENOMENON
W. D. Langer, S. A. Cohen, D. M. Manos, D. H. McNeill, R. W. Motley, M. Ono, and S. Paul *In* NASA. Marshall Space Flight Center 2d Workshop on Spacecraft Glow Sep. 1985 p 202-211 refs (For primary document see N86-13239 03-88)
(Grant NAG8-521; Contract DE-AC02-76CH-03073)
Avail: NTIS HC A13/MF A01 CSCL 03B

N86-13261*# Aerospace Corp., El Segundo, Calif. Chemistry and Physics Lab.
APPLICATION OF AN ATOMIC OXYGEN BEAM FACILITY TO THE INVESTIGATION OF SHUTTLE GLOW CHEMISTRY
Graham S. Arnold and Daniel R. Peplinski *In* NASA. Marshall Space Flight Center 2d Workshop on Spacecraft Glow Sep. 1985 p 212-225 refs (For primary document see N86-13239 03-88)
Avail: NTIS HC A13/MF A01 CSCL 03B

N86-13263*# Smithsonian Astrophysical Observatory, Cambridge, Mass.
INFRARED MEASUREMENTS OF SPACECRAFT GLOW PLANNED FOR SPACELAB 2
Giovanni G. Fazio and David G. Koch *In* NASA. Marshall Space Flight Center 2d Workshop on Spacecraft Glow Sep. 1985 p 243-249 refs (For primary document see N86-13239 03-88)
(Contract NAS8-32845)
Avail: NTIS HC A13/MF A01 CSCL 03B

N86-13264*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
PLANNED INVESTIGATION OF INFRARED EMISSIONS ASSOCIATED WITH THE INDUCED SPACECRAFT GLOW: A SHUTTLE INFRARED GLOW EXPERIMENT (SIRGE)
Michael J. Mumma and Donald E. Jennings *In* NASA. Marshall Space Flight Center 2d Workshop on Spacecraft Glow Sep. 1985 p 250-259 refs (For primary document see N86-13239 03-88)
Avail: NTIS HC A13/MF A01 CSCL 03B

N86-13265*# Lockheed Missiles and Space Co., Palo Alto, Calif.
DATA REQUIREMENTS FOR VERIFICATION OF RAM GLOW CHEMISTRY
Gary R. Swenson and Steven B. Mende *In* NASA. Marshall Space Flight Center 2d Workshop on Spacecraft Glow Sep. 1985 p 260-268 (For primary document see N86-13239 03-88)
Avail: NTIS HC A13/MF A01 CSCL 03B

N86-13266*# Utah State Univ., Logan. Dept. of Physics.
A POSSIBLE GLOW EXPERIMENT FOR THE EOM 1-2 MISSION Abstract Only
Marsha R. Torr *In* NASA. Marshall Space Flight Center 2d Workshop on Spacecraft Glow Sep. 1985 p 269 (For primary document see N86-13239 03-88)
Avail: NTIS HC A13/MF A01 CSCL 03B

N86-13267*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
SPACE SHUTTLE MECHANISTIC STUDIES TO CHARACTERIZE ATOMIC OXYGEN INTERACTIONS WITH SURFACES
Lubert J. Leger and James T. Visentine *In* NASA. Marshall Space Flight Center 2d Workshop on Spacecraft Glow Sep. 1985 p 270-273 (For primary document see N86-13239 03-88)
Avail: NTIS HC A13/MF A01 CSCL 03B

N86-13268*# Science Applications International Corp., Bellevue, Wash.
THE SHUTTLE GLOW: A PROGRAM TO STUDY THE RAM-INDUCED PHENOMENA
Hugh R. Anderson *In* NASA. Marshall Space Flight Center 2d Workshop on Spacecraft Glow Sep. 1985 p 274-276 (For primary document see N86-13239 03-88)
Avail: NTIS HC A13/MF A01 CSCL 03B

N86-13269*# Colorado Univ., Boulder. Lab. for Atmospheric and Space Physics.
SURVEY OF ULTRAVIOLET SHUTTLE GLOW Abstract Only
Kerry A. Spear, Gregory J. Uckler, and Kent Tobiska *In* NASA. Marshall Space Flight Center 2d Workshop on Spacecraft Glow Sep. 1985 p 277 (For primary document see N86-13239 03-88)
Avail: NTIS HC A13/MF A01 CSCL 03B

36 LASERS AND MASERS

Includes parametric amplifiers.

N86-12597 Department of the Air Force, Washington, D.C.
HIGH POWER LASER DUMP Patent
M. S. Hsu and J. P. Hsu, inventors (to Air Force) Issued 16 Aug. 1985 5 p Supersedes AD-D010540
(AD-D011792; US-Patent-4,511,216; US-Patent-Class-350-311)
Avail: US Patent and Trademark Office CSCL 20/5

A high power laser dump has defined laser beam introduction angles to the internal surface of a cylinder to maximize energy dispersion and absorption and, has two zones formed of distinctive reflective and absorbing materials. Author (GRA)

N86-12598 Department of the Air Force, Washington, D.C.
CO2 LASER STABILIZATION AND SWITCHING Patent
N. E. Buholz, inventor (to Air Force) Issued 23 Apr. 1985 7 p Supersedes AD-D010358
(AD-D011795; US-Patent-4,513,422; US-Patent-Class-372-29)
Avail: US Patent and Trademark Office CSCL 20/5

A CO2 laser operating in the 10 micrometer and is stabilized by a stabilization circuit that compares the power in a selected pair of R and P lines. A switching circuit connected into the stabilization circuit causes the laser's operating point to be switched within a short interval wherein four different pairs of R/P lines can be output within about 100 ms. GRA

N86-12599 Department of the Navy, Washington, D. C.
LASER GENERATION OF ULTRASONIC WAVEFORM RECONSTRUCTIONS Patent
W. R. Scott and C. S. Ih, inventors (to Navy) Issued 18 Jun. 1985 5 p Supersedes AD-D011314
(AD-D011843; US-Patent-4,523,469; US-Patent-Appl-SN-459073; US-Patent-Class-73-603) Avail: US Patent and Trademark Office CSCL 20/5

In this patent a series of pulses are transmitted to a first laser and the same series of pulses through a time delay network to a second laser. Each laser provides pulses of light through separate diagonal mirrors and through respective transparent holograms. Each light is then brought into convergence by respective sides of a wedge shaped reflector and brought into spatially coincident focus by an imaging lens onto the surface of a sample under test. The two hologram transparencies are imaged spacially coincident but separated in time on the face of the sample. Thermal elastic waves produced by laser heating at the sample surface transform into a desired acoustic beam pattern determined by the nature of the wavefronts which the hologram transparency represents. The position of the coincident image on the sample may be moved by varying the time between the two pulses. GRA

N86-12600*# Hampton Inst., Va. Dept. of Physics and Engineering.
DIRECT SOLAR-PUMPED IODINE LASER AMPLIFIER Semiannual Progress Report, 1 Apr. - 30 Sep. 1985
Kwang S. Han 30 Sep. 1985 50 p refs
(Grant NAG1-441)
(NASA-CR-176324; NAS 1.26:176324) Avail: NTIS HC A03/MF A01 CSCL 20E

This semiannual progress report covers the period from April 1, 1985 to Sept. 30, 1985 under NASA grant NAS1-441 entitled direct solar pumped iodine laser amplifier. During this period the parametric studies of the iodine laser oscillator pumped by a Vortek simulator was carried out before the amplifier studies. The amplifier studies are postponed to the extended period following completion of the parametric studies. In addition, the kinetic modeling of a solar pumped iodine laser amplifier, and the experimental work for a solar pumped dye laser amplifier are in progress. This report contains three parts: (1) the radiation characteristics of solar simulator and the parametric characteristics of photodissociation iodine laser continuously pumped by a Vortek solar simulator; (2) kinetic modeling of a solar pumped iodine laser amplifier; and (3) the study of the dye laser amplifier pumped by a Tamarack solar simulator. Author

N86-12601# Air Force Office of Scientific Research, Bolling AFB, Washington, D.C. Foreign Technology Div.
APPLIED LASERS (SELECTED ARTICLES)
20 May 1985 74 p Transl. into ENGLISH from Ying Yong Ji Guang (China), v. 3, no. 5-6 and v. 4, no. 1, 1983 p 18-22, 25-27, 23-26, 27-30, 10, 38-42 43-48 36-37
(AD-A155948; AD-E301698; FTD-ID(RS)T-1564-84) Avail: NTIS HC A04/MF A01 CSCL 20/5

Several articles on lasers and laser applications are presented. Topics covered include: frequency stability of lasers; discharge stability; laser beam modulation; laser pumping; and wavelength demarcation. Investigations are carried out on dye lasers, helium-neon lasers, carbon dioxide lasers, and semiconductor lasers. GRA

N86-12602# Department of the Navy, Washington, D. C.
LASER VIBROMETER Patent Application
M. J. Rudd, inventor (to Navy) Filed 31 Aug. 1984 17 p
(AD-D011811; US-Patent-Appl-SN-645888) Avail: NTIS HC A02/MF A01 CSCL 14/2

This Abstract disclosures an optical interferometric apparatus for detecting and measuring discontinuities in structural materials from ultrasonic stress waves at their surfaces. The apparatus includes an acousto-optic (a/o) modulator which shifts a portion of a laser beam in frequency, producing a modulated beam of light. This modulated light beam is deflected and passes through an adjustable lens to the surface being measured. The light scattered by the surface is focused by the lens on an end mirror of the laser which produced the original beam, and is divergingly reflected therefrom. The reflected, scattered light is heterodyned with the unshifted portion of the laser beam in a photodiode to produce a phase modulated signals at the acoustic frequency of the a/o modulator. Surface displacement can be measured as a function of instantaneous phase shift, and surface velocity as a function of rate of change of phase shift. GRA

N86-12603# Department of the Army, Washington, D. C.
PULSED DIGITAL MULTIPLEXED LASER GENERATOR Patent Application
T. E. Honeycutt and T. G. Roberts, inventors (to Army) Filed 25 Jun. 1985 22 p
(AD-D011855; US-Patent-Appl-SN-758919) Avail: NTIS HC A02/MF A01 CSCL 17/2

A system of lasers which produces a single pulsed laser beam carrying many channels of digital information simultaneously is discussed. The information content of each laser output pulse is determined by the presence or absence of one or more input signal channel frequencies. The presence or absence of each frequency is provided by a plurality of low power CW lasers operating at different frequencies and which are selectively gated in a binary fashion by pulse coded digital input signals to provide digitized low power laser outputs in accordance with the digital input signals. The low level pulses of the various optical frequencies are combined and utilized to preload a relatively high power pulsed CO2 output laser. A pair of mirror assemblies are utilized to respectively combine the multifrequency channel pulses and transmit a single pulsed output laser beam generated by the pulsed output laser. The presence or absence of each frequency component in each output pulse is determined by the frequency components preloading the cavity modes of the pulsed high power output laser. Author (GRA)

N86-12604# Cornell Univ., Ithaca, N.Y. Baker Lab.
STUDIES OF ENERGY STORAGE AND TRANSFER IN GAS LASERS Final Technical Report, 1 Mar. 1982 - 28 Feb. 1985
J. Wiesenfeld 28 Apr. 1985 12 p
(Grant AF-AFOSR-0037-82)
(AD-A158553; AFOSR-85-0504TR) Avail: NTIS HC A02/MF A01 CSCL 20/5

This experimental program was designed to elucidate the behavior of electronically excited atoms and molecules in gases and examine methods by which these species might generally be detected using laser-based spectroscopic techniques. To that end, several atomic and molecular states were observed using Resonance Multiphoton Ionization, In addition, the photodissociative production of electronically excited states was investigated and the subsequent deactivation of excited atoms in collisional encounters with molecules studied. GRA

N86-12605# Lawrence Livermore National Lab., Calif.
SCIENCE, TECHNOLOGY AND THE INDUSTRIALIZATION OF LASER-DRIVEN PROCESSES
J. I. Davis and J. A. Paisner May 1985 21 p
(Contract W-7405-eng-48)
(DE85-014856; UCID-20448) Avail: NTIS HC A02/MF A01

Members of the laser program at Lawrence Livermore National Laboratory (LLNL) potential applications of lasers in industry, some of which are: isotope separation, cleanup of radioactive waste, trace impurity removal, selective chemical reactions, photochemical activation or dissociation of gases, control of combustion particulates, crystal and powder chemistry, and laser induced biochemistry are reviewed. Many of these areas are currently under active study

in the community. The investigation at LLNL focused on laser isotope separation of atomic uranium because of the large demand and high product enrichment price for material used as fuel in commercial light-water nuclear power reactors. They also believed that once the technology was fully developed and deployed, it could be applied directly to separating many elements economicprogram at LLNL has an extensive uranium and plutonium program of > $100 M in Fy85 and a minor research program for other elements. This report describes the AVLIS program conducted covering the following topics: candidate elements, separative work units, sepctroscopic selectivety, major systems, facilities, integrated process model, multivariable sensitivity studies, world market, and US enrichment enterprise. DOE

N86-12606# Lawrence Livermore National Lab., Calif.
DYNAMIC ADI COMPUTATIONS OF THERMOELASTIC STRESSES IN CRYSTALLINE LASER MEDIA
R. J. Gelinas, S. K. Doss, and N. N. Carlson 1985 14 p Presented at the 4th Intern. Conf. on Numerical Methods in Laminar and Turbulent Flow, Swansea, Engl., 8 Jul. 1985 Prepared in cooperation with California Univ., Berkeley
(Contract W-7405-eng-48)
(DE85-010478; UCRL-92424; CONF-850745-2) Avail: NTIS HC A02/MF A01

This article considers thermoelastic effects which influence both the thermal engineering design and optical propagation in solid state high average power laser (HAPL) systems. The methods and computations described were developed for applications, ultimately, to crystalline slabs with arbitrary symmetry properties and with arbitrary spatial orientations between crystalline axes and slab configurations. For this, accurate numerical solutions are required simultaneously for the heat equation and Hooke's law in their most general tensor forms. Prompted by the optical problem requirements in HAPL systems, this work utilizes implementations of Eulerian discretizations and dynamic ADI methods for solving general fourth order elliptic partial differential equations (PDE's) which describe stress potentials in anisotropic media. These formulations can provide both steady state and transient PDE solutions. Computed results for trigonal Al2O3 crystal deformations in various crystal axes/slab orientations are presented. DOE

N86-12607# Oak Ridge National Lab., Tenn.
NEW BEAM NEUTRALIZATION CONCEPT: LASER PHOTODETACHMENT IN A MAGNETIC FIELD
O. H. Crawford and H. F. Krause 1985 21 p Presented at the Neutralizer Workshop, Upton, N.Y., 5 Jun. 1985
(Contract DE-AC05-84OR-21400)
(DE85-014655; CONF-8506150-1) Avail: NTIS HC A02/MF A01

The major advantage of laser photodetachment as a method for neutralizing a negative ion beam is that the emittance increase can be made as small as desired. Since the momentum of the photon is negligible, it is only the recoil from the leaving electron that causes any beam spread in photodetachment. The closer the laser is turned to the threshold frequency, the smaller the relative energy of the electron and atom, and the smaller the recoil. The problem with photodetachment is the high laser power requirement. The cross section approaches zero as the laser frequency approaches the detachment threshold. As a consequence, for a high-brightness application it is estimated that the laser power required would exceed the anticipated beam power. It is shown that the imposition of a solenoidal magnetic field in the neutralization region may make photodetachment practical, by enhancing the cross section. DOE

N86-12608# Los Alamos National Lab., N. Mex.
STRATEGIC DEFENSE INITIATIVES AT LOS ALAMOS NATIONAL LABORATORY
S. D. Rockwood 1985 3 p Presented at the Southwest Conf. on Opt., Albuquerque, N. Mex., 4 Mar. 1985
(Contract W-7405-eng-36)
(DE85-014093; LA-UR-85-2177; CONF-850345-25) Avail: NTIS HC A02/MF A01

This presentation reviews the Strategic Defense Initiative (SDI) programs, noting especially the needs for and applications of optics and optical technologies. The various activities at Los Alamos contributing to SDI programs are used. The principal, nonnuclear SDI programs are: (1) the free electron laser, and (2) neutral particle beams. Both should be considered as potential long-range-kill systems, but still in the futuristic category. DOE

N86-12394# Joint Publications Research Service, Arlington, Va.
COMPACT TEA-CO2 LASER WITH LONG LIFE DEVELOPED
Yin Yiyan, Zhang Yixiang, Want Zongjin, Wei Xianren, and Gao Chunguang *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-016) 23 May 1985 p 36-42 refs Transl. into ENGLISH from Yingyong Jiguang (Shanghai), v. 5, no. 1, Feb. 1985 p 39-42 (For primary document see N86-12393 03-31)
Avail: NTIS HC A08/MF A01

N86-12395# Joint Publications Research Service, Arlington, Va.
FREQUENCY SELECTION AND MODE LOCKING OF Nd:YAG LASER
Tang Guichen and Qiu Peixia *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-016) 23 May 1985 p 43-50 refs Transl. into ENGLISH from Zhongguo Jiguang (Shanghai), v. 12, no. 1, 20 Jan. 1985 p 11-14 (For primary document see N86-12393 03-31)
Avail: NTIS HC A08/MF A01

N86-12419# Joint Publications Research Service, Arlington, Va.
LONG WAVE (1.2 - 1.5 MICRONS) SEMICONDUCTOR LASERS
Pan Zhonghau, Yang Guisheng, Ran Chongzhu, Zhao Songshan, and Wang Yuzhang *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-018) 12 Jun. 1985 p 99-105 refs Transl. into ENGLISH from Tongxin Xuebao (Beijing), no. 1, Jan. 1984 p 68-71 (For primary document see N86-12413 03-31)
Avail: NTIS HC A09/MF A01

N86-12428# Joint Publications Research Service, Arlington, Va.
HIGH-POWER ND: GLASS LASER AND TARGET CHAMBER SYSTEM AND AN EXPERIMENTAL STUDY OF LASER PLASMA X-RAY
Wu Hongxing, Guo Dahao, Zhou Yusheng, Zhang Limin, He Weimin, and Dai Yusheng *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-021 8 Jul. 1985 p 132-140 refs Transl. into ENGLISH from Zhongguo Kexue Jishu Daxue Xuebao (Hefei), v. 15, no. 1, Mar. 1985 p 30-36 (For primary document see N86-12421 03-31)
Avail: NTIS HC A09/MF A01

N86-12431# Joint Publications Research Service, Arlington, Va.
LASER SCATTERING IN PLASMA EXAMINED
Lu Quankang, Chen Hang, Yin Qi, and Wang Wenhua *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-034) 1 Oct. 1985 p 49-52 refs Transl. into ENGLISH from Ziran Zazhi (Shanghai), v. 7, no. 7, Jul. 1984 p 555-557 (For primary document see N86-12430 03-31)
Avail: NTIS HC A08/MF A01

N86-12454# Joint Publications Research Service, Arlington, Va.
EFFECT OF AMPLIFIED SPONTANEOUS EMISSION ON SPACE COHERENCE OF XeCl LASER
Zhang Dake, Wang Xiaoyi, Ni Jinzhi, Yao Jianping, Fu Shufen, and Chen Jianwen *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-030) 4 Sep. 1985 p 36-44 refs Transl. into ENGLISH from Zhongguo Jiguang (Shanghai), v. 12, no. 5, 20 May 1985 p 261-265 (For primary document see N86-12451 03-31)
Avail: NTIS HC A08/MF A01

N86-12455# Joint Publications Research Service, Arlington, Va.
FIRST DOMESTIC HIGH REPETITION RATE ULTRASHORT PULSE LASER
Guang Lin *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-030) 4 Sep. 1985 p 45 Transl. into ENGLISH from Zhongguo Jiguang (Shanghai), v. 12, no. 5, no. 5, 20 May 1985 p 278 (For primary document see N86-12451 03-31)
Avail: NTIS HC A08/MF A01

N86-12456# Joint Publications Research Service, Arlington, Va.
PRACTICAL EXCIMER LASER DEVELOPED
Qun Li *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-030) 4 Sep. 1985 p 46 Transl. into ENGLISH from Zhongguo Jiguang (Shanghai), v. 12, no. 5, 20 May 1985 p 297 (For primary document see N86-12451 03-31)
Avail: NTIS HC A08/MF A01

N86-12457# Joint Publications Research Service, Arlington, Va.
A HIGH PRECISION RATE DYE LASER PUMPED BY A CuCl LASER
Jing Chunyang, Zhang Guiyan, Wu Zhengliang, Shu Juping, Hu Qiquan, Ying Lifeng, and Lin Fucheng *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-030) 4 Sep. 1985 p 47-53 refs Transl. into ENGLISH from Zhongguo Jiguang (Shanghai), v. 12, no. 7, 20 Jul. 1985 p 394; 399-401 (For primary document see N86-12451 03-31)
Avail: NTIS HC A08/MF A01

N86-12460# Joint Publications Research Service, Arlington, Va.
LASER INDUCED BIOLOGICAL HEATING ANALYZED
Liu Puhe *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-026) 15 Aug. 1985 p 71-76 refs Transl. into ENGLISH from Zhongguo Jiguang (Shanghai), no. 11, 20 Nov. 1984 p 697-700 (For primary document see N86-12459 03-31)
Avail: NTIS HC A07/MF A01

N86-12465# Joint Publications Research Service, Arlington, Va.
CHINA DEVELOPS 6J KrF LASER
Wang Ganchang, Zhu Xuhui, Wang Naiyan, Xie Jinggang, Li Yinghshan, Zhou Changhuai, and Wang Pu *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-032) 19 Sep. 1985 p 62-66 refs Transl. into ENGLISH from He Kexuy yu Gongcheng (Beijing), v. 5, no. 1, Mar. 1985 p 1-5 (For primary document see N86-12462 03-31)
Avail: NTIS HC A08/MF A01

N86-12734# Joint Publications Research Service, Arlington, Va.
TRANSMISSION OF TROPOSPHERIC RADIATION OF LASERS ON MOLECULES OF DIFFERENT CARBON DIOXIDE ISOTOPES Abstract Only
V. N. Arefyev *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-008) 16 Aug. 1985 p 41 Transl. into ENGLISH from Kvantovaya Elektron. (Moscow), v. 12, no. 3, Mar. 1985 p 631-634 (For primary document see N86-12697 03-42)
Avail: NTIS HC A04/MF A01

37 MECHANICAL ENGINEERING

Includes auxiliary systems (non-power); machine elements and processes; and mechanical equipment.

N86-12609*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
SURFACE FATIGUE LIFE AND FAILURE CHARACTERISTICS OF EX-53, CBS 1000M, AND AISI 9310 GEAR MATERIALS
Dennis P. Townsend Oct. 1985 14 p refs
(NASA-TP-2513; E-2578; NAS 1.60:2513) Avail: NTIS HC A02/MF A01 CSCL 13I

Spur gear endurance tests and rolling-element surface fatigue tests are conducted to investigate EX-53 and CBS 1000M steels for use as advanced application gear materials, to determine their endurance characteristics, and to compare the results with the standard AISI 9310 gear material. The gear pitch diameter is 8.89 cm (3.50 in). Gear test conditions are an oil inlet temperature of 320 K (116 F), an oil outlet temperature of 350 K (170 F), a maximum Hertz stress of 1.71 GPa (248 ksi), and a speed of 10,000 rpm. Bench-type rolling-element fatigue tests are conducted at ambient temperature with a bar specimen speed of 12,500 rpm and a maximum Hertz stress of 4.83 GPa (700 ksi). The EX-53 test gears have a surface fatigue life of twice that of the AISI 9310 spur gears. The CBS 1000M test gears have a surface fatigue life of more than twice that of the AISI 9310 spur gears. However, the CBS 1000M gears experience a 30-percent tooth fracture failure which limits its use as a gear material. The rolling-contact fatigue lines of RC bar specimens of EX-53 and ASISI 9310 are approximately equal. However, the CBS 1000M RC specimens have a surface fatigue life of about 50 percent that of the AISI 9310.
Author

N86-12610*# Talandic Research Corp., Pasadena, Calif.
ADVANCED TORQUE CONVERTERS FOR ROBOTICS AND SPACE APPLICATIONS Final Report
Jul. 1985 60 p refs
(NASA-CR-177987; NAS 1.26:177987) Avail: NTIS HC A04/MF A01 CSCL 13I

This report describes the results of the evaluation of a novel torque converter concept. Features of the concept include: (1) automatic and rapid adjustment of effective gear ratio in response to changes in external torque (2) maintenance of output torque at zero output velocity without loading the input power source and (3) isolation of input power source from load. Two working models of the concept were fabricated and tested, and a theoretical analysis was performed to determine the limits of performance. It was found that the devices are apparently suited to certain types of tool driver applications, such as screwdrivers, nut drivers and valve actuators. However, quantiative information was insufficient to draw final conclusion as to robotic applications.
Author

N86-12611# Massachusetts Inst. of Tech., Cambridge. Dept. of Materials Science and Engineering.
FUSION WELDING RESEARCH Annual Technical Report, 15 Feb. 1983 - 15 Feb. 1984
T. W. Eagar, G. B. Hunter, G. J. Dunn, C. D. Sorensen, and M. L. Lin 30 Apr. 1984 122 p
(Contract N00014-80-C-0384)
(AD-A158127; ATR-4) Avail: NTIS HC A06/MF A01 CSCL 13/8

Research studies on the physics of arc welding processes include: (1) vapor emission from weld pools; (2) development of a high speed infrared temperature monitor; (3) digital signal analysis of weld noise voltages; (4) convection and surface depression of the weld pool; (5) pulsed current gas metal arc welding of titanium; (6) contact tip wear in gas metal arc welding of titanium; (7) fracture toughness of HY-80 weldments; and (8) Sensitization of 304 stainless steel welds. Heavy section titanium; HY-80 weld metal; Sensors for arc welding automation.
GRA

N86-12612# Department of the Air Force, Washington, D.C.
LIGHTWEIGHT CRYOGENIC TANK WITH POSITIVE EXPULSION Patent Application
J. C. Lewis, inventor (to Air Force) Filed 12 Jul. 1984 14 p
(AD-D011856; US-Patent-Appl-SN-630148) Avail: NTIS HC A02/MF A01 CSCL 13/4

A lightweight tank structure for the storage and controlled expulsion therefrom of a cryogenic liquid is a flexible metallic bladder. An interior collapsible volume for containing the cryogenic liquid, a second high pressure container enclosing the first container, a third container enclosing the second container and including supports for maintaining the second container in a spaced relationship within the third container, a first tube operatively connected to the first container through which the cryogenic liquid may be inserted into the first container and controllably expelled therefrom, a source of pressurized gas, and a tube operatively interconnecting the second container and the gas source for controllably supplying pressurized gas to the interior of the second container whereby the contained cryogenic liquid may be controllably expelled by controlled collapsing of the bladder of the first container are described. Additional insulation in the form of a layer of foam on the exterior surface of the third container, and of a cryogenic coolant or a vacuum maintained in the space between the second and third containers may be included.
Author (GRA)

N86-12613# SKF Industries, Inc., King of Prussia, Pa.
MECHANICAL INTERACTIONS OF ROUGH SURFACES Quarterly Progress Report, 1 Apr. - 30 Jun. 1985
J. I. McCool and G. B. Hadden Jul. 1985 45 p
(Contract DE-AC02-84ER-13163)
(DE85-015011; DOE/ER-13163/7; SKF-AT85D031) Avail: NTIS HC A03/MF A01

The projects, Mechanical Interactions of Rough Surfaces addresses a number of unresolved issues which impact the design of mechanical systems in which surface microtopography per se or events which occur on the microgeometric scale play a critical role. The project is an experimental/analytical investigation to: (1) explore the behavior of lubricated concentrated contacts involving microscopically rough surfaces under conditions of combined rolling, sliding and spinning with and without the presence of contaminating particles; (2) develop processing principles and techniques for the analysis of digitized rough surface profiles to yield surface descriptors that are predictive of functional performance and which have acceptable systematic and random error. The work is conducted within two distinct tasks. In task 1, a rig designed and built by SKF is used to provide optical interferograms of the lubricated contact of rough surfaces along with measurements of the traction transmitted under conditions of combined rolling, sliding and spinning. The objective of task 2 is to develop guidelines and techniques for the processing of surface roughness data generated in a analog form by a stylus profile instrument to provide interpretable predictions of surface performance on contact. DOE

N86-12614# Aspen Systems Corp., Marlborough, Mass.
PRELIMINARY DESIGN OF LINEAR ALTERNATOR DYNAMOMETER FOR FREE PISTON STIRLING ENGINES Final Report
K. P. Lee and W. M. Toscano Jun. 1985 159 p refs
(Contract DE-AC05-84OR-21400)
(DE85-015078; ORNL/Sub-84-05907/1) Avail: NTIS HC A08/MF A01

A preliminary design of a linear alternator type dynamometer for testing free piston Stirling engines (FPSEs) is prepared. The purpose of the dynamometer is to provide the FPSEs with simulated loads such as double acting inertia compressors for heat pumps, hydraulic pumps, and linear alternators. The dynamometer has two major components: the electromechanical transducer and the control system. The dynamometer control system utilizes active force control scheme. The control system operates in two modes simultaneously: the foreground mode and the background mode. The foreground mode instantaneously regulates the current to the armature coil according to the predetermined load force profile. The background mode continually refines the load force profile and upgrades the foreground mode load force profile until convergence is reached. The digital simulation of the entire system including the control system, the dynamometer, and the RE-1000 FPSE showed that the dynamometer is capable of simulating various loads very accurately and fast. DOE

N86-12615# Oak Ridge National Lab., Tenn.
COMPARATIVE ANALYSIS OF A STIRLING HEAT PUMP WITH SECOND- AND THIRD-ORDER COMPUTER MODELS
N. Domingo Jun. 1985 37 p refs
(Contract DE-AC05-87OR-21400)
(DE85-013536; ORNL/CON-162) Avail: NTIS HC A03/MF A01

Performance and loss terms obtained with the NASA third order (nodal analysis) computer model were compared with the results obtained with the Martini ISO82 second order model for a Stirling cycle heat pump. Because no Stirling heat pump test data exist to substantiate the accuracy of these models, it was not possible to designate one model as clearly superior. Agreement between the models' overall predictions was -2 to 13% for indicated power, 18 to 29% for net heat output, and 10 to 20% for indicated heating COP. Poor agreement was found between the calculated pressure drop, mechanical friction, and conduction losses. Better identification and quantification of loss mechanisms is suggested as a more meaningful step toward the development of better design models. DOE

N86-12616# Oak Ridge Y-12 Plant, Tenn.
ELECTROCHEMICAL MACHINING OF THE OUTER PROFILE OF THE B83 LUG
J. D. Hensley 28 Jun. 1985 56 p
(Contract DE-AC05-84CS-21400)
(DE85-014934; Y-2341) Avail: NTIS HC A04/MF A01

A development program was conducted which demonstrates the capability of electrochemical machining (ECM) as a viable production method for generating the outer contour profile of the B83 Lug. It is indicated that the machining time can be reduced from hours, the time required by conventional methods of metal removal, to minutes. Ordinarily, many fixtures and setups would be required to shape the features of the outer profile, as was experienced during conventional machining of the B61 Lug. In ECM the part-feature size and location are designed into the tooling, and only one operation is required to achieve the desired contour. Due to the accuracy and complexity of the cathode design, considerable testing and evaluation would normally be required to develop the process; however, the experience obtained during development of the smaller B61 Lug ECM process made it possible to produce usable E83 Lugs on the first attempt. DOE

N86-12617# Oak Ridge Gaseous Diffusion Plant, Tenn.
CORRECTION OF COMPRESSOR CRITICAL SPEED CONDITION THROUGH FLUID-FILM BEARING OPTIMIZATION
J. W. Spencer and V. E. Obeid 1985 32 p ref Presented at the AMSE Vibration and Sound Conf., Cincinnati, 10 Sep. 1985
(Contract DE-AC05-84OT-21400)
(DE85-005507; CONF-850926-4) Avail: NTIS HC A03/MF A01

A critical speed condition for an overhung centrifugal compressor was corrected through a relatively minor bearing modification. The resonant condition was evaluated analytically through rotor dynamic analyses which included fluid film bearing characterization and rotor model generation. The importance of adequate specification, inspection, and analytical characterization, of fluid film bearings are discussed. The effects of unbalance on the stability of plain journal bearings are also commented upon. DOE

N86-12618# Foster-Miller Associates, Inc., Waltham, Mass.
DEVELOPMENT OF THE HYDROTRANSPORT BOOST PUMP Open File Report, Sep. 1981 - Dec. 1984
L. S. Rubin, R. L. Cardenas, M. Burnette, J. Roberge, and A. Harvey 31 Dec. 1984 255 p refs
(Contract DI-BM-J0-133934)
(PB85-203776; BM-OFR-49-85) Avail: NTIS HC A12/MF A01 CSCL 13K

A ventilated helical boost pump was developed that can handle varying flow rates and/or solids concentrations while operating at a single rotational speed. The boost pump developed and briefly tested was designed to accomodate flows suitable for a 3-in-diam. pipeline. The boost pump's ventilated design provides the automatic pressure regulation needed to meet the system's requirements for supporting transient pipeline flow. A maximum discharge pressure of 120 psi was achieved at an operating speed of 3,000 rpm. Coal flow rates of up to 1,000 lb/min were successfully processed with a nonshrouded single vane impeller. GRA

N86-12382# Tokyo Denki Univ. (Japan). Faculty of Engineering.
STUDY OF HIGH SPEED SHEARING OF THERMOPLASTIC POLYMER SHEETS WITH A NEW ROTARY SHEARING MACHINE
Isami Aoki and Teizo Maeda *In its* Res. Rept. of the Faculty of Eng., Tokyo Denki Univ., No. 32 Dec. 1984 p 157-168 refs
(For primary document see N86-12372 03-31)
Avail: NTIS HC A09/MF A01

N86-12404# Joint Publications Research Service, Arlington, Va.
PLASMA ARC WELDING FOR THIN TITANIUM PLATES
Luo Jinru and Tang Xingli *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-035) 17 Oct. 1985 p 52-62 refs Transl. into ENGLISH from Shiyou Huagong Shebei (Lanzhou), v. 14, no. 4,

1985 p 11-16 (For primary document see N86-12399 03-31)
Avail: NTIS HC A08/MF A01

38 QUALITY ASSURANCE AND RELIABILITY

Includes product sampling procedures and techniques; and quality control.

N86-12619# Hughes Aircraft Co., Fullerton, Calif. Ground Systems Group.
STUDY AND INVESTIGATION TO UPDATE THE NONELECTRONIC RELIABILITY NOTEBOOK. REVISION A Final Technical Report, Jun. 1982 - Apr. 1984
J. E. Augus, R. G. Arno, and N. R. Mann Apr. 1985 235 p
(Contract F30602-82-C-0127)
(AD-A157242; HAC-FR-84-16-681-Rev-A; RADC-TR-85-66-Rev-A)
Avail: NTIS HC A11/MF A01 CSCL 12/1

This report describes the investigations and analyses performed in connection with revising and updating the Nonelectronic Reliability Notebook (Formerly RADC-TR-75-22). It includes detailed descriptions of the statistical analyses performed, the data base on which the Nonelectronic Reliability Notebook is based, new part classification outlines, and a section on advanced statistical techniques for analyzing life data. GRA

N86-12620# Materials Research Labs., Ascot Vale (Australia).
DEVELOPMENT AND EVALUATION OF A MICROBURST TEST APPARATUS FOR USE AS A MINIMUM DESTRUCTIVE TEST FOR PARACHUTE MATERIAL
G. T. Egglestone, N. M. Browne, and M. Taylor Apr. 1985 33 p
(AD-A158110; MRL-R-959) Avail: NTIS HC A03/MF A01 CSCL 11/5

Conventional testing of parachute canopy materials to identify the extent of polymer degradation requires large amounts of material resulting in extensive repairs if the material is found to be sound. A microburst test apparatus designed and built at the Materials Research Labs is capable of testing the canopy in-situ, with a degree of damage confined to a 3.2 mm diameter hole. This does not require repair and fits between a ripstop repeat on canopy material from modern day T-1 0 parachutes. The microburst unit gives a digital readout for maximum pressure to burst and pressure to burst/time integral. Correlations between these results and those from conventional tensile and Mullens burst tests showed the microburst test results to more closely resemble those from accepted tensile test methods. GRA

N86-12621# Brookhaven National Lab., Upton, N. Y.
ULTRASONIC ATTENUATION IN CLEAN ANISOTROPIC SUPERCONDUCTORS
S. N. Coppersmith and B. A. Klemm 29 May 1985 10 p Presented at Mater. and Mech. of Superconductivity Conf., Ames, Iowa, 29 May 1985 Prepared in cooperation with Exxon Research and Engineering Co., Annandale, N. J.
(Contract DE-AC02-76CH-00016)
(DE85-012178; DOE/BNL-036528; CONF-8505138-5) Avail: NTIS HC A02/MF A01

The ultrasonic attenuation of UPt3 in the hydrodynamic regime was found to be proportional to T sup 2 at low temperatures T. In the opposite limit, ql much larger than, it is found that the ultrasonic attenuation for an anisotropic superconductor has a temperature dependence that depends on the nodal structure of the gap and on the relative orientation of the sound wave and the nodes. Both power law and exponential temperature dependences are found to be possible for gaps with either points or lines of nodes, depending upon the sound wave orientation relative to the nodes. In some directions, finite experimental resolution must be taken into account. DOE

39 STRUCTURAL MECHANICS

Includes structural element design and weight analysis; fatigue; and thermal stress.

For applications see *05 Aircraft Design, Testing and Performance* and *18 Spacecraft Design, Testing and Performance.*

N86-12622 Texas Univ., Austin.
INFLUENCE OF BONDED REINFORCEMENT IN POST-TENSIONED PRESTRESSED CONCRETE T-BEAMS WITH UNBONDED TENDONS Ph.D. Thesis
Chaiwat Changwatchai 1984 344 p
Avail: Univ. Microfilms Order No. DA8508257

For the proper design of a prestressed member with an unbonded tendon, supplemental bonded reinforcement must be provided in the tension zone of the critical section to insure satisfactory behavior of the member. The minimum amount of bonded bar suggested in the current ACI Code is based on an empirical formula. When we apply this formula to a member with a T-shaped section, the amount of bonded reinforcing bar is often substantially higher in the negative moment region than in the positive moment region. In order to study the criteria for determining the amount of bonded bar needed, an experimental program was conducted to observe and gather information on the role of bonded reinforcement in T-shaped post-tensioned members with unbonded tendons. Four full size T-shaped specimens which represent portions of a widely used post-tensioned concrete joist system of construction were tested to failure. Author

N86-12623# Army Armament Research and Development Command, Watervliet, N. Y. Large Caliber Weapon Systems Lab.
MORE ON COMPLIANCE OF THE THREE-POINT BEND SPECIMEN Final Report
J. H. Underwood, J. A. Kapp, and F. I. Baratta May 1985 15 p
(AD-A156665; AD-E440286; ARLCB-MR-85015) Avail: NTIS HC A02/MF A01 CSCL 20/11

Comparison and analysis of load-line displacement for the three-point bend specimen was performed. Expressions were developed for displacement as a function of crack length and for crack length as a function of displacement. GRA

N86-12624# Washington Univ., Seattle. Dept. of Mechanical Engineering.
STRAIN ENERGY DENSITY CRITERIA FOR DYNAMIC FRACTURE AND DYNAMIC CRACK BRANCHING
M. Ramulu and A. S. Kobayashi Jul. 1985 24 p
(Contract N00014-85-K-0187)
(AD-A157914; UWA/DME/TR-85/51) Avail: NTIS HC A02/MF A01 CSCL 20/11

Dynamic extension of Sih's fracture criterion based on strain energy density factor, r sub c (dW/dV), is used to analyze dynamic crack propagation and branching. Influence of the nonsingular components, which are known as the higher order terms (HOT) in the crack tip stress field, on the strain energy density distribution at a critical distance surrounding the crack tip moving at constant crack velocity is examined. This r sub c (dW/dV) fracture criterion is then used to analyze available dynamic photoelastic results of crack branching and of engineering materials. Author (GRA)

N86-12625# Optimization, Inc., Blacksburg, Va.
MODELING AND CONTROL OF FLEXIBLE STRUCTURES Final Report, 31 Aug. 1984 - 4 Mar. 1985
J. A. Burns, E. M. Cliff, R. M. Goff, H. J. Kelley, and F. H. Lutze May 1985 101 p
(Contract F04611-84-C-0032)
(AD-A157959; K506-1; AFRPL-TR-85-030) Avail: NTIS HC A06/MF A01 CSCL 12/1

The principal goals of this program were a demonstration of state-space procedure for modeling and control of a flexible structure, and, more generally, increased understanding of control problems for such systems. The state-space approach is based on a model of the distributed system. The model includes the

necessary partial differential equations without modal truncation. The basic view is that it is preferable to avoid introducing approximations until they are required (e.g., for numerical calculations). The program (formal modal, state-space model, optimal-control formulation, approximation procedure and numerical calculation) is carried out, in detail, for a simple structural system including a rotating hub, a flexible beam and a tip mass. A final section in this part provides some parallel results for a more complex structure comprised of a hub, two flexible support beams and a tip-body. The second part of the report is concerned with some parasitic effects on the stability of a distributed system with feedback. The approach is based on an input-output description of the system; specifically, a transfer-function approach is used. In order to keep the calculation burden reasonably small the structural model studied is a simple cable which requires only second-order spatial derivatives. The baseline system employs feedback of a force to the free-end of the cable at a magnitude proportional to the velocity at the free end. The gain parameter can be varied to produce a locus of roots; albeit one with a countable infinite number of branches. GRA

N86-12626# Oak Ridge National Lab., Tenn.
MULTIFREQUENCY EDDY-CURRENT INSPECTION OF SEAM WELD IN STEEL SHEATH
J. H. Smith, C. V. Dodd, and I. D. Chitwood Apr. 1985 173 p
(Contract DE-AC05-84OR-21400)
(DE85-013533; ORNL/TM-9470) Avail: NTIS HC A08/MF A01

Multifrequency eddy-current techniques were used to perform a continuous on-line inspection of the seam weld in the steel jacket for a superconducting cable. The inspection was required to detect both surface and internal weld flaws in the presence of a large, highly conductive central conductor. Raw eddy-current data were recorded on magnetic tape, and test properties such as discontinuity size and weld penetration were determined by mathematically fitting these data to coefficients developed with representative standards. A sophisticated computer-controlled scanning technique was applied, and a unique scanning device was developed to provide full coverage of the weld and heat-affected zone. The techniques used to develop this multifrequency eddy-current examination are described along with the test equipment, test procedures, and computer programs. DOE

N86-12627# Argonne National Lab., Ill.
THEORY FOR THE PORTEVIN-LECHATELIER EFFECT
R. B. Schwarz Aug. 1985 7 p Presented at the 7th Intern. Conf. on the Strength of Metals and Alloys, Montreal, 12 Aug. 1985
(Contract W-31-109-eng-38)
(DE85-004030; CONF-850823-1-Abst) Avail: NTIS HC A02/MF A01

The models advanced to explain the PL effect are concerned with the critical strain, the stress serrations occurring in a T-regime, and the negative strain-rate sensitivity. A new model is proposed which also explains the rest of the observations, including the different types of serrations, localized deformation, and grouping of type-B serrations. DOE

N86-12628# Lawrence Livermore National Lab., Calif.
FAILURE CRITERIA USED IN A PROBABILISTIC FRACTURE MECHANICS CODE
T. Y. Lo 1985 8 p refs Presented at the 8th Intern. Conf. on Struct. Mech. in Reactor Technol., Brussels, 19 Aug. 1985
(Contract W-7405-eng-48)
(DE85-007264; UCRL-91242; CONF-850809-12) Avail: NTIS HC A02/MF A01

Two criteria are implemented in a piping reliability analysis code to assess the stability of crack growth in pipes. One is the critical net section stress criterion. It is simple and convenient but its application is limited to very ductile materials. The other is the tearing modulus stability criterion. This criterion has a solid technical base. However, calculating the J-integral, J, and the associated tearing modulus, T, usually requires a complicated finite element method (FEM). In this piping reliability code, existing J and T solutions in tabular or formula form instead of the FEM are used for computational efficiency. These two failure criteria are discussed and compared in terms of their effects on the estimation of pipe failure probability. DOE

N86-12629# Lawrence Livermore National Lab., Calif.
MOTION OF THIN METAL WALLS AND THE EQUATION OF STATE OF DETONATION PRODUCTS
E. Lee, D. Breithaupt, C. McMillan, N. Parker, J. Kury, C. M. Tarver, W. Quirk, and J. Walton 8 Jul. 1985 11 p refs Presented at the 8th Intern. Symp. on Detonation, Albuquerque, N. Mex., 15 Jul. 1985
(DE85-014809; UCRL-91490; CONF-850705-24) Avail: NTIS HC A02/MF A01

High resolution measurements made by using cylinders and flat plates to determine detonation product behavior are reported. By using thin walled cylinders and thin plates and by utilizing both streak camera and Fabry-Perot velocimeter techniques resolution and accuracy much greater than previously are obtained. Results for an explosive formulation, LX-14, containing 95% HMX and 5% polyurethane and are presented these experimental results of hydrodynamic calculations. Thin plates and varying plate thickness are used to derive the explosive behavior independent of the metal properties. The reaction zone in the explosive is resolved in the acceleration of the thinnest plates. This reaction front behavior is considered in the equation of state description. It is shown that the cylinder test measurements sample the EOS at expansion ratios $V/VO > 1$. Thin flat plates aligned in the plane of the detonation front provide detailed information on the higher compression states. The results of earlier work with respect to the pressure derivatives are confirmed. DOE

N86-12400# Joint Publications Research Service, Arlington, Va.
NEW CRITERION OF COMBINED-MODE BRITTLE FRACTURE DESCRIBED
Lin Baisong *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-035) 17 Oct. 1985 p 27-33 refs Transl. into ENGLISH from Yingyong Shuxue He Lixue (Chongqing), v. 5, no. 6, Nov. 1984 p 849-853 (For primary document see N86-12399 03-31)
Avail: NTIS HC A08/MF A01

N86-12420# Joint Publications Research Service, Arlington, Va.
COUPLING BETWEEN SPINOR FIELD, PROPAGATING TORSION
Xu Jizhong *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-018) 12 Jun. 1985 p 106-110 refs Transl. into ENGLISH from Wuhan Daxue Xuebao (Wuhan), no. 1, Mar. 1984 p 47-50 (For primary document see N86-12413 03-31)
Avail: NTIS HC A09/MF A01

N86-12374# Tokyo Denki Univ. (Japan). Faculty of Engineering.
EARTHQUAKE-RESPONSE SIMULATION ON HORIZONTALLY LARGE-SCALE BUILDINGS BASED ON THE METHOD OF REDUCTION CONCERNING THEIR RESTORING SPRING MATRIX. DERIVATION OF GENERAL FORM OF SPRING MATRIX AND COMPARISON OF APPLIED RESPONSE RESULTS ON AN ACTUAL BUILDING WITH MEASURED VALUES
Fukuzo Suto and Shyuichi Asayama *In its* Res. Rept. of the Faculty of Eng., Tokyo Denki Univ., No. 32 Dec. 1984 p 13-35 refs In JAPANESE; ENGLISH summary (For primary document see N86-12372 03-31)
Avail: NTIS HC A09/MF A01

N86-12375# Tokyo Denki Univ. (Japan). Faculty of Engineering.
A COMPUTER ANALYSIS OF THE DISTRIBUTION OF PRINCIPAL STRESSES USING PHOTOELASTIC PATTERN
Shoichi Ohi, Makoto Kotani, Masataka Nisida, Seiji Nakajima, and Setsuzo Honda *In its* Res. Rept. of the Faculty of Eng., Tokyo Denki Univ., No. 32 Dec. 1984 p 37-49 refs In JAPANESE;

ENGLISH summary (For primary document see N86-12372 03-31)
Avail: NTIS HC A09/MF A01

42 GEOSCIENCES (GENERAL)

N86-12630# Joint Publications Research Service, Arlington, Va.
USSR REPORT: EARTH SCIENCES Abstracts Only
19 Jun. 1985 91 p Transl. into ENGLISH from various Russian articles
(JPRS-UES-85-006) Avail: NTIS HC A05/MF A01

Research and progress in U.S.S.R. earth sciences are reported. Topics discussed include: meteorology, oceanography, terrestrial geophysics, atmospheric physics, and Arctic and Antarctic research. For individual titles, see N86-12631 through N86-12696.

N86-12631# Joint Publications Research Service, Arlington, Va.
METEOROLOGICAL CENTER'S FORECASTS AID VENUS PROBE TRACKING Abstract Only **c47**
M. Dmitruk *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 1 Transl. into ENGLISH from Sots. Ind. (Moscow), 23 Mar. 1985 p 3 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

Severe-storm warning services provided by the hydrometeorological scientific research center are reported. Warning of hurricane-force winds, heavy precipitation, sharp temperature changes and other severe weather are furnished by this center. Weather maps are prepared by computers which perform 1.5 million operations a second. The computers make it possible to heighten the accuracy and usefulness of information on severe weather phenomena. Accurate forecasts of strong winds over a period of 8 months by the 64 meter radio telescope dish antenna save trouble-free receptions by the antenna of singlas from automatic interplanetary stations which are orbiting Venus. E.A.K.

N86-12632# Joint Publications Research Service, Arlington, Va.
DIAGNOSIS OF WEATHER STATES IN WINTER OF 1980-1981 Abstract Only **c47**
G. P. Kurbatkin *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 2 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atm. i Okeana (Moscow), v. 20, no. 11, Nov. 1984 p 1011-1016 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

Maps of winter weather states from December 1980 through February 1981 for the Rocky Mountains and Gulf of Alaska are used to study the complex nonlinear mechanisms by which bottom boundary conditions influence changes in atmosphere circulation. The weather states for December and for January are found to differ significantly. The diagnostic estimates show that nonadiabatic processes changing global atmospheric circulation are related to unsteady fluctuations in atmospheric dynamics and are unsteady. The modeling and prediction of changes in such quasisteady weather states is complex. It is recommended that heat fluxes are studied by mathematical models and by direct measurement. E.A.K.

N86-12633# Joint Publications Research Service, Arlington, Va.
MAIN PROBLEMS IN CLIMATE MONITORING (DIAGNOSIS) Abstract Only **c47**
G. V. Gruza, K. G. Rubinshteyn, B. A. Birman, and V. N. Razuvayev *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 2 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atm. i Okeana (Moscow), v. 20, no. 11, Nov. 1984 p 1017-1026 Original language document was announced in IAA as A85-17976 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

The problem of climate monitoring is examined in the context of the global system of environmental monitoring. In particular, attention is given to the scientific, engineering, and administrative problems involved. A possible organization for a system of climate monitoring in the USSR is proposed, and examples of the experimental monitoring of the earth atmosphere on hemispherical and regional (for the USSR) scales are presented. V.L. (IAA)

N86-12634# Joint Publications Research Service, Arlington, Va.
USE OF METHOD OF CANONICAL CORRELATIONS FOR ANALYSIS OF CLIMATIC SERIES Abstract Only **c47**
M. S. Tatarskaya and M. I. Fortus *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 3 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atm. i Okeana (Moscow), v. 20, no. 11, Nov. 1984 p 1027-1034 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

The application of the canonical correlations method to problems of statistical climate prediction was studied. The method is applicable to the task of funding functions of future values which are predicted on the basis of past values with minimal error. The method was first applied to meteorology in 1967 to study the statistical relationship between mean monthly water temperature in the North Atlantic and the mean monthly air temperature over the European USSR in December. It is demonstrated that appliction of the method for actual climatic series allows determination of optimal predicted values. The accuracy of prediction of values in some cases such as in the prediction of mean annual temperature values in the 30-80 N latitude zone, can be significantly greater than the prediction of actual values in the series. EAK

N86-12635# Joint Publications Research Service, Arlington, Va.
EMPIRICAL ANALYSIS OF DIRECT AND INVERSE RELATIONSHIPS BETWEEN MACROSCALE CHARACTERISTICS OF ATMOSPHERIC PROCESSES IN NORTHERN HEMISPHERE AND THERMAL STATE OF NORTH ATLANTIC Abstract Only **c47**
M. I. Yudin, V. M. Mirvis, and I. Ye. Chuvashina *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 3-4 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atm. i Okeana (Moscow), v. 20, no. 11, Nov. 1984 p 1035-1041 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

New empirical data are presented on direct and inverse relationships in the ocean-atmosphere system. The data are summarized and the hypothesis that there are a number sequences of direct and inverse relationships and self-oscillating processes is confirmed. The initial data used consisted of monthly values of changes in heat content in the upper 100-meter water layer in the North Atlantic between 1949 and 1982. The relationship of cloud cover and the thermal state of the ocean was analyzed. The statistical analysis reveals a cyclic processes in the ocean-atmosphere system, and chains of direct and inverse relationships. Cold-season North Atlantic heat content anomalies are significant for subsequent development of large-scale atmospheric processes, which in turn cause disturbances in the thermal state of the ocean. EAK

N86-12636# Joint Publications Research Service, Arlington, Va.
ATMOSPHERIC AEROSOL AND ITS EFFECTS ON CLIMATE Abstract Only **c47**
K. Ya. Kondratyev and M. A. Prokofyev *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 4-5 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atm. i Okeana (Moscow), v. 20, no. 11, Nov. 1984 p 1055-1063 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

The influence of atmospheric aerosol on climate is discussed. The importance of the contribution of aerosol-radiation effects to the energy budget of the atmosphere was studied. It is reported that large-scale systematic dust episodes in the troposphere are related to deserts and volcanic phenomena. Formulation of models of the radiation and microphysical properties of aerosol were considered. The climatic effects of tropospheric and stratospheric are distinguished. Major trends are noted for the climatic effect of aerosols: (1) development of a realistic aerosol model for climate sensitivity studies; (2) comparison of existing radiation transfer

models which take aerosol effects into account; (3) inclusion of radiation transfer parameters in the atmosphere with the aerosol in climatic models; and (4) determination of global aerosol types necessary for climatic modeling by model experiments. EAK

N86-12637# Joint Publications Research Service, Arlington, Va.
INFLUENCE OF POWER ENGINEERING ON CLIMATE Abstract Only **c47**
V. A. Legasov, I. I. Kuzmin, and A. N. Chernoplekov *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 6 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atm. i Okeana (Moscow), v. 20, no 11, Nov. 1984 p 1089-1103 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

The influence of power production on changes in global climate to estimate the effect of this factor over the long term on possible limitations in the increase in power consumption and the structure and fuel power balance was studied. The scale of the effect of powerplants on climate and the possible nature of these effects was estimated and, power engineering is determined to be a significant climate-altering factor, requiring consideration of climatic effects in the determination of power development strategies. The ecological aspects of the problem of safe development of power engineering must include determination of the effectiveness of appropriations for protection of the earth from the danger from possible climatic change. Defining quantitative indices reflecting changes in climate with sufficient accuracy is a major problem. E.A.K.

N86-12638# Joint Publications Research Service, Arlington, Va.
RECENT CHANGES IN CLIMATE AND WORLD WATER BALANCE Abstract Only **c47**
S. G. Dobrovolskiy and R. K. Klinge *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 6 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Ser. Geogr. (Moscow), no. 1, Jan. - Feb. 1985 p 31-38 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

Water exchange between the ocean and the landmasses free of continental glaciation occurs by fluxes of mositure whose deviations from the mean in individual years are not dependent on one another and which are only slightly related to changes in the global temperature regime. In the series of water balance components for the continents there are no long-term trends. The fluctuations of the mean annual mositure fluxes exchanged between the oceans and continents are determined by a combination of local evaporation factors. This is consistent with the Hasselmann stochastic theory of climate. There is only a slight correlation between iceberg runoff and macroscale changes in the temperature regime, and the correlation between iceberg runoff and precipitation series. Changes in the annual increments of water volume in the ocean also have a stochastic character. The principal contribution to variability of the annual increments of water volumes in the oceans and water reserves on the land however, iceberg runoff, primarily from Anterctica. It is suggested that the changes is in volume of continental glaciation and ocean level are less sensitive to changes in air temperature than to changes in the precipitation regime. Precipitation falling on the continental glaciers, especially in Antarctica, is the most probable mechanism of changes in ocean level in the near future. E.A.K.

N86-12639# Joint Publications Research Service, Arlington, Va.
CLIMATICALLY ACTIVE TRACE GASES IN ATMOSPHERE Abstract Only **c47**
I. L. Karol *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 5 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atm. i Okeana (Moscow), v. 20, no. 11, Nov. 1984 p 1064-1074 Original language document was announced in IAA as A85-17981 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

The global atmospheric cycles of trace gases affecting solar and thermal radiation fluxes and their anthropogenic changes are briefly reviewed. The gases discussed include methane, nitrogen oxides, tropospheric ozone, and chlorofluorohydrocarbons. The contribution of these gases to the greenhouse effect and the influence of the greenhouse effect on the photochemistry of the trace gases in the atmosphere are analyzed. Model estimates of the variance of the mean annual surface air temperature in the Northern Hemisphere due to a measured increase in the content of trace gases in the atmosphere are presented. V.L. (IAA)

N86-12640# Joint Publications Research Service, Arlington, Va.
ESTIMATE OF RADIATION-CLIMATIC EFFECTS OF NATURAL AND ANTHROPOGENIC AEROSOL Abstract Only **c47**
N. I. Manuylova, V. K. Petukhov, T. A. Tarasova, and Ye. M. Feygelson *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 5 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atm. i Okeana (Moscow), v. 20, no. 11, Nov. 1984 p 1075-1080 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

Investigation and parameterization of the radiation aerosol effect are presented. Radiation effects of aerosol lead to changes into the albedo and absorptive capacity of the climatic system, resulting in restructuring of its dynamic parameters. The change in mean global albedo for the system is estimated for aerosols of varying optical thickness and absorptive capacity. The absorptive capacity is the major climate-forming parameter of aerosol, along with the number and size of aerosol particles. The aerosol significantly influences the temperature status of the climatic system primarily through direct changes in system albedo, to a lesser extent by the restructuring of the system caused by the aerosol. E.A.K.

N86-12641# Joint Publications Research Service, Arlington, Va.
MODELING OF SEASONAL EVOLUTION OF CARBON CYCLE IN OCEAN-ATMOSPHERE SYSTEM Abstract Only **c46**
B. A. Kagan, V. A. Ryabchenko, and A. S. Safray *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 13 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atm. i Okeana (Moscow), v. 21, no. 1, Jan. 1985 p 66-75 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

A combined model for the seasonal evolution of heat conditions and the carbon cycle in the ocean-temperature system is proposed. The atmosphere and ocean in the northern hemisphere are represented as a system of five interconnected boxes - two atmospheric and three oceanic. The two oceanic boxes are the upper quasihomogeneous layer and the deep layer of the ocean in the temperature and lower latitudes, within which the influx of heat from the atmosphere is balanced by vertical advection of cold deep waters. It is shown that the major factors determining the mean values and seasonal variability of characteristics of the carbon cycle in the ocean-atmosphere system are the existence in the ocean of cold deep water formations with sharp increases in rate of absorption of atmospheric CO2, fluctuation of sources and sinks of organic CO2 and variation of ocean water temperatures. External factors include the short-wave solar radiation flux at the upper atmosphere boundary, absorption and emission of short wave and long wave radiation, atmospheric and surface albedo, mean annual production, consumption and half-life of organic matter, ocean depth, wind speed, humidity and continental area. E.A.K.

N86-12642# Joint Publications Research Service, Arlington, Va.
STUDY OF SIGNIFICANCE OF BOTTOM RELIEF IN BAROCLINIC MODEL OF EQUATORIAL COUNTERCURRENT Abstract Only **c48**
T. F. Kuzmicheva, E. N. Mikhaylova, and N. B. Shapiro *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 14 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atm. i Okeana (Moscow), v. 21, no. 1, Jan. 1985 p 58-65 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

Time variability and nonlinear interaction of barotropic and baroclinic components of current velocity was studied, taking into account bottom relief in the process of formation of an equatorial countercurrent under the influence of an easterly wind and the

heat flux through the ocean surface. The wind and heat flux excite circulation in the upper layer of the ocean. Processes in the baroclinic layer, acting though vertical movements at its lower boundary, cause movement in the deeper layers. During the initial stage, deep circulation does not match the bottom relief, the velocities of barotropic currents are high, particularly in shallow areas, and may significantly influence the current in the baroclinic layer. As time passes, deep currents and currents in the baroclinic layer adapt to the bottom relief, which is accompanied by a reduction in horizontal velocity gradients over submerged elevations. E.A.K.

N86-12643# Joint Publications Research Service, Arlington, Va.
ANGULAR DISTRIBUTION OF INTENSITY OF SOUND RERADIATED BY OCEAN SURFACE AT SMALL GLANCING ANGLES Abstract Only c71
Ye. A. Kopyl *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 14 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atm. i Okeana (Moscow), v. 21, no. 1, Jan. 1985 p 98-101 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

A quantitative interpretation of field measurements of the angular structure of signals reradiated by the ocean surface with glancing incidence of acoustical waves is presented. Experimental and calculated values agree satisfactorily. E.A.K.

N86-12644# Joint Publications Research Service, Arlington, Va.
INFLUENCE OF SHORT GRAVITY WAVES ON THERMAL RADIO EMISSION OF WATER SURFACE Abstract Only c32
V. A. Ilin, A. A. Naumov, V. Yu. Rayzer, S. R. Filonovich, and V. S. Etkin *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 15 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atm. i Okeana (Moscow), v. 21, no. 1, Jan. 1985 p 83-89 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

An experimental study is presented of the thermal radio emission caused by short waves, accompanied by a quantitative interpretation of the data obtained. Emphasis is on an analysis of the variation in radio brightness contrast as a function of steepness of the short gravity waves, measured by means of a high-frequency radiometer operating in the lambda = 0.8 cm range. Waves were artificially generated in a small channel, wavelength 8 to 40 cm, height 0.6 to 3 cm. Due to the high sensitivity of the radiometric apparatus used, effects were recorded which were related to the influence of the profile and steepness of the short gravity waves. The possibility of using the geometrical optics approximation for quantitative interpretation of the experimental data is demonstrated. The model is based on essentially non-Gaussian statistics of slopes corresponding to quasimonochromatic waves of finite amplitude. Author

N86-12645# Joint Publications Research Service, Arlington, Va.
UPPER MESOZOIC TURBIDITES OF SOUTHERN WEST SAKHALIN DOWNWARP Abstract Only c46
S. V. Zyabrev *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 15-16 Transl. into ENGLISH from Tikhookeanskaya Geol. (Novosibirsk), no. 5, Sep. - Oct. 1984 p 22-33 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

In the west Sakhalin downwarp the Albian deposits are very thick terrigenous masses, nonuniform alternations of sandstones, siltstones and argillites with some other rocks formed by erosion of the products of underwater and continental volcanism. The textures and specifics of stratification of deposits in the southern portion of the west Sakhalin downwarp were studied in order to determine the origin of the sedimentary formations, conditions of sedimenation and their evolution. The deposits are interpreted as turbidities. Western sources of clastic material were established. The deposits were formed in deep-water alluvial fan systems at the base of a deep water slope dropping down toward the east. Ancient currents confirm the western sources of clastic material and indicate significant separation from the eastern edge of the basin. Changes in facies in the section in a lateral direction are not related to transgressions and regressions on the eastern side of the downwarp, but rather reflect the specifics of the sedimentation process. Traces of erosion and redeposition of argillite and sandstone fragments are not related to erosion of the eastern side of the downwarp but rather to the sedimentation process itself. Author

N86-12646# Joint Publications Research Service, Arlington, Va.
SPECTRUM OF TURBULENT FLUCTUATIONS IN SEA WATER DENSITY IN REGION OF LARGE WAVE NUMBERS Abstract Only c48
M. A. Bramson, A. D. Fedorovskiy, V. I. Nikishov, and G. L. Luchnik *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 16 Transl. into ENGLISH from Dokl. Akad. Ukr. SSR, Ser. A: Fiz-Mat. i Tekhn. Nauki (Kiev), no. 12, Dec. 1984 p 35-38 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

The study of turbulent pulsations of velocity, temperature, salinity and density, and particularly of the behavior of spectral characteristics on the small scale, is an important subject in current studies of the ocean. The pulsation spectrum of the density of sea water in the region of large wave numbers was analyzed. Turbulent inhomogeneities of the fields of temperature and salinity on a small scale are also analyzed. The spectral characteristics of pulsations of the density field and the boundary of the viscous-convective interval are determined by two parameters which can be measured by simultaneous recording of T and S pulsations by two sensors separated by a known distance. The averaging interval for the measurements can be rather small since the spatial scale corresponding to the viscous-convective internal is small. Processing of measurements can be alternated. Author

N86-12647# Joint Publications Research Service, Arlington, Va.
INTERACTION OF SOUND WAVES WITH FINE THERMOHALINE STRUCTURES OF OCEAN Abstract Only c48
V. V. Artelnyy and M. A. Rayevskiy *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 17 Transl. into ENGLISH from Akust. Zh. (Moscow), v. 30, no. 6, Nov. - Dec. 1984 p 728-734 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

The interaction of acoustical waveguides with the fine thermohaline structure of the ocean is analyzed on the assumption of multiple scattering. A study is made of a number of effects occurring in a broad class of waveguides as a result of the presence of a fine structure, including attenuation of the coherent component of the sound field, changes in its angular spectrum, transformation of normal mode energy and losses resulting from pumping of energy from nodes localized in the waveguide to modes attenuation in the surrounding ground. The results obtained are extended by means of a passage to the limit to the case of a channel with a sudden change in the speed of sound. The main results of the study are extended to the case of an underwater channel with a balanced profile. Author

N86-12648# Joint Publications Research Service, Arlington, Va.
CORRELATION CHARACTERISTICS OF SIGNALS REFLECTED BY THE WAVY SURFACE OF OCEAN IN MIRROR DIRECTION Abstract Only c32
Yu. Yu. Zhitkovskiy, A. V. Nosov, and V. V. Savelyev *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 18 Transl. into ENGLISH from Akust. Zh. (Moscow), v. 30, no. 6, Nov. - Dec. 1984 p 772-776 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

An experimental study was carried out to determine the correlation characteristics of pseudonoise signals reflected from a wave-covered surface in the mirror direction. The major measured quantity was the reciprocal correlation coefficient between the transmitted signal and the reflected signal. The transmitter was lowered from a ship on a 150 m cable. The receiver and preamplifier were lowered to the same depth from a buoy which was allowed to drift from the ship to a distance of 100-500 m, the changing distance changing the angle of the beam reflected from the surface

of the ocean back down to the hydrophone. The radiator transmitted a pulsed signal with a pseudonoise carrier. The results were interpreted within the framework of ordinary correlation theory by processing several recordings, calculating the sign and ordinary correlation coefficients to determine the variation in sign correlation coefficient as a function of the ordinary correlation coefficient. Graphs of the average variation are presented. It was found that the medium did not distort the signal as it propagated through the water mass (within the limits of experimental accuracy). The correlation coefficient between the transmitted and reflected signals is thus determined entirely by the characteristics of reradiation of the sound by the wavecovered surface. Author

N86-12649# Joint Publications Research Service, Arlington, Va.
NUMERICAL ESTIMATE OF EFFECTIVENESS OF APPROXIMATE EQUATIONS FOR ACOUSTIC FIELD NEAR SURFACE OF DEEP SEA **c71**
M. V. Perel *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 18 Transl. into ENGLISH from Akust. Zh. (Moscow), v. 30, no. 6, Nov. - Dec. 1984 p 813-818 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

The acoustic field in an oceanic waveguide is calculated. The calculations for various velocity profiles confirm the effectiveness of the approximate equations of V. S. Buslayev. Author

N86-12650# Joint Publications Research Service, Arlington, Va.
PETROCHEMICAL TYPES OF MAGMATIC ROCKS OF OCEAN FLOOR AND PATTERNS OF THEIR DISTRIBUTION Abstract Only **c46**
A. V. Abramov, V. M. Ryakhovskiy, and Yu. V. Mironov *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 19 Transl. into ENGLISH from Byul. Mosk. Obshch. Ispytateley Prirody: Otd. Geol. (Moscow), v. 60, no. 1, Jan. - Feb. 1985 p 18-27 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

In order to classify petrochemical data on ocean floor crustal rocks an algorithm for processing multivariate samples, a nonparametric classification method was used. The classification includes no priori assumptions concerning the structure of the sample and introduces no predefined numerical criteria. The distances between points are applicable to samples with any multivariate distrition. The initial data used were compositions of magmatic oceanic rock from a previous publication. The processing allowed the following numbers of clusters to be distinguished in the sample in each of the four steps: 239, 90, 29. 7. The seven final clusters are described. It is concluded that the absence of unidirectional petrochemical evolution of oceanic basalts upon transition from one morphological structure to another and their sharp petrochemical specialization in this case indicate the relative nondependence of the paths of development of different morphostructural zones in the ocean floor. Author

N86-12651# Joint Publications Research Service, Arlington, Va.
INTRUSIVE ROCKS OF OCEANIC LITHOSPHERE AS POSSIBLE SOURCES OF ANOMALOUS MAGNETIC FIELD OF OCEAN Abstract Only **c46**
Ye. A. Nazarova *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 19-20 Transl. into ENGLISH from Byul. Mosk. Obshch. Ispytateley Prirody: Otd. Geol. (Moscow), v. 60, no. 1, Jan. - Feb. 1985 p 28-41 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

Results are presented from study of rock dredged from the ocean floor, plus data published in a previous review on the magnetic characteristics of 50 oceanic intrusive rocks brought up during several cruises of the Glomar Challenger. The intrusive rocks represent a cross-section of the oceanic crust. The samples available are very few in number. Available data on ore mineralogy and magnetic characteristics are analyzed for the available specimens. Analysis of the magnetic characteristics of the rocks shows that neither fresh cumulative gabbro containing fine-grained magnetite nor amphibolitized serpentinized gabbro containing magnetite grains from pseudo-single-domain to multi-domain size can be considered regulator sources of linear magnetic anomalies. Thin dolerite sills containing fine-grained magnetite with hardened edges may be sources of local magnetic anomalies. Periodotites representing the lower portion of layer 3B and the upper mantle, upon sepentinization, as a result of the formation of secondary magnetite, take on intensive and stable chemical magnetization. Only serpentinized cumulative peridotites have the necessary magnetic characteristics to be sources of linear magnetic anomalies. Author

N86-12652# Joint Publications Research Service, Arlington, Va.
MAGMATIC PROVINCES AND TECTONICS IN PACIFIC OCEAN Abstract Only **c46**
Yu. M. Pushcharovskiy *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 21 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Ser. Geol. (Moscow), no. 11, Nov. 1984 p 13-18 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

A determination of correlations between the large structural formations and basalt magmatism of the Pacific Ocean floor is very important for an approach to the geological history problems of this area. There have been at least two major tectonic-magmatic stages in the central and northwestern Pacific. Each major stage reflects a unique combination of geological conditions. The possibility of distinguishing and differentiating magmatic provinces allows basaltic series differing in their petrochemical features and content of individual metals to be distinguished. Analysis of the composition of mantle tectonics has shown regional differences in the composition of the upper mantle existing before the partial melting with which the formation of specific complexes is associated. The correlation which has been observed between magmatism and major tectonic elements and regions in the Pacific indicates the complex picture of geological development of the lithosphere in this area, which cannot be reduced to simplified systems of movement of a homogeneous lithospheric monolith. Implementation of the Soviet research project Litos will provide important new data on the geology of the oceans. However, additional specialized marine expeditions in different oceans are required to supplement the available factual information. Author

N86-12653# Joint Publications Research Service, Arlington, Va.
GEOCHEMISTRY AND ENERGETICS OF CYCLING OF MATTER IN FORMATION OF CRUST IN ACTIVE STRUCTURES OF OCEAN Abstract Only **c48**
V. A. Ilin and A. V. Shcherbakov *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 22 Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 279, no. 5, Dec. 1984 p 1184-1189 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

A geochemical model was developed to check the quantiative relationships between the sedimentary and volcanogenic matter during the course of the cycling of matter related to the formation of the crust in active ocean structures. The model shows that the subduction zone should receive iron and magnesium ions from the mantle. Remaining elements are carried into the crust, the accumulation of silica and alumina in the crust supporting constant oxidation. The problem of the high content of Ca in sedimentary rock and the shift of the Na/K ratio in the direction of K are explained. The model thus explains the observed chemical differentiation between continental and oceanic crusts, as well as the mechanism of their development and evolution. Processes of transformation of an oceanic crust to a continental crust in subduction zones are calculated to require 7.5 x 10 to the 18 calories of heat per year. the hydrothermal process on the continents and ocean floor consumes 8.0 x 10 to the 18 cal/yr, 6.4 x 10 to the 18 cal/yr being carried away by hydrotherms and 1.6 x 10 to the 18 cal/yr being absorbed by deep hydrothermal systems. This means that the major effect of hydrothermal activity is restricted to the midocean ridges, only one-fifth being associated with volcanic regions. Author

N86-12654# Joint Publications Research Service, Arlington, Va.
CONTRIBUTION OF DIFFUSION PROCESSES TO THE ELECTRIC FIELD OF THE OCEAN Abstract Only c48
P. Ya. Tishchenko *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 24 Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 279, no. 5, Dec. 1984 p 1234-1238 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

A study was made of that portion of the electric field in the ocean which results from diffusion of ions in sea water due to the presence of concentration gravitational and temperature fields. Methods of linear nonequilibrium thermodynamics are used in the study. An electric profile was computed to establish the magnitude and nature of the electric field in the ocean caused by the processes in question, corresponding to an arbitrary hydrophysical profile. All three contributions to the total electric field considered are of the same order of magnitude. The maximum electric field gradients are found in the upper levels of the ocean where the changes in parameters t and S are greater. Author

N86-12655# Joint Publications Research Service, Arlington, Va.
OIL AND GS DEPOSITS ON CONTINENTAL SLOPES OF THE OCEAN Abstract Only c43
A. A. Geodekyan, A. Zabanbark, and A. I. Konyukhov *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 24-25 Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 280, no. 2, Jan. 1985 p 423-426 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

It has been suggested that some 95% of the hydrocarbon deposits in the ocean will probably be found in shelf zones and on the continental slopes at depths of not over 3,000 m and 65% not over 300 m. Some twenty-six deposits of oil, gas and gas condensate were found to date on the continental slopes of the ocean. Almost all hydrocarbon deposits are located on the slopes of the passive continental margins of the Atlantic and Indian Oceans. The collectors for oil and gas deposits are almost exclusively sandstones. Analysis of known deposits shows that ancient delta complexes on the continental margins contain oil and gas not only because they are characterized by good collectors, but also primarily due to the optimal relationship of natural reservoirs, continental rock and cover horizons. There are two stages in the formation of regional oil- and gas-bearing terrigenous masses, genetically related to rivers: periods of rift formation and burial of continental margins, and periods of cretaceous or early Cenozoic tectonic activation within the limits of a margin already formed, during which sinking occurred in the areas where ancient transverse rifts met the ocean. Author

N86-12656# Joint Publications Research Service, Arlington, Va.
ACOUSTICAL FIELD OF DIRECTIONAL SOURCE IN OCEANIC WAVEGUIDES Abstract Only c71
G. I. Bykovtsev, G. N. Kuznetsov, and A. N. Stepanov *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 25 Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 280, no. 1, Jan. 1985 p 57-59 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

A model is suggested for an equivalent point source having arbitrary directionality to replace actual sound sources radiating in an ocean waveguide. The model allows calculation of the hydroacoustical fields of directional sources in a medium limited by division boundary surfaces for sufficiently low radiating frequencies. Expressions are obtained for the potential of an equivalent point source in waveguides of various types. By minimizing the maximum likelihood functional it is possible to use measured pressure values to estimate the multipole moments determining the directionality of radiation. The parameter estimation procedure using this method is better than when a Taylor expansion model is used. Author

N86-12657# Joint Publications Research Service, Arlington, Va.
PETROLOGIC ASPECT OF FORMATION OF GEOSTRUCTURES IN MARGINAL SEAS Abstract Only c46
L. L. Perchuk *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 25-26 Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 280, no. 1, Jan. 1985 p 178-182 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

A study was made of the petrology of formation of geological structures in the marginal seas, since data are not available relating geodynamics and magmatism of intracontinental depressions. It was demonstrated in the example of the Sea of Japan that the formation of depressions is preceded by orogeny with superimposed acid and neutral magmatism and subsequent intensive denudation of volcanic structures. A change in the direction of vertical motion corresponds to predominance of andesites and basalts in volcanism, accumulation of thick masses of tuffs in narrow geosynclinal depressions, followed by intensive underwater flows of andesite-basalts and basalts. The hypothesis suggesting formation of depressions by the mechanism of magmatic substitution must be further experimentally and theoretically developed and confirmed. Author

N86-12658# Joint Publications Research Service, Arlington, Va.
SPREADING IN DEVELOPMENT OF OCEANIC STRUCTURES Abstract Only c46
Yu. M. Pushcharovskiy and S. V. Ruzhentsev *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 26 Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 280, no. 1, Jan. 1985 p 182-185 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

Data on the time of formation of tholeiitic basalts of different ages in the midocean ridges are incomplete. Based on studies of the East Pacific Rise and the western limb of the Mid-Atlantic Ridge, an attempt is made to explain differences in the structure of the first and second layers of the ocean on the one hand and volcanic-sedimentary series of various stages of development of eugeosynclinal zones in the Paleozoic folded belts on the other. Among the widely varied structures of the oceanic crust, the contemporary oceans represent a type characterized by the presence of a single world system of narrow volcanically active ocean spreading centers. Reconstructed paleoocean structures arose in a more complex geodynamic situation than the oceans. They are characterized by distributed spreading, which appeared in the contemporary oceans in the early stages of their development. The essence of evolution of the Phanerozoic structures with the oceanic type crust was one of changes from smaller but more complex structures and combinations to larger and simpler structures. The mesooceans can be considered transitional structures. Author

N86-12659# Joint Publications Research Service, Arlington, Va.
INFLUENCE OF WATER VAPOR ON DISTRIBUTION OF TURBULENT WAVE PARAMETERS Abstract Only c02
N. N. Pilyugin and S. G. Tikhomirov *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 26-27 Transl. into ENGLISH from Mekhan. Zhidkosti i Gaza (Moscow), no. 1, Jan. - Feb. 1985 p 138-142 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

An experimental study was made of phenomena transpiring in an air flow near models flying on an aeroballistic path at hypersonic velocities. The objective was a determination of the influence of water vapor on measurements of gas parameters such as electron concentration or radiation intensity. The results are given of computations of the distributions of nonequilibrium parameters in a wake with allowance for chemical reactions in the air and water vapor under conditions characteristic for aeroballistic experiments. Specifically, the authors give a solution of equations for an axisymmetric turbulent boundary layer describing a current of a nonequilibrium multicomponent gas in the distant wake behind such a body moving at hypersonic velocity. On this basis a model of chemical kinetics is presented which takes 22 components into account. A total of 91 reactions is possible. A list of reactions

between dry air components is given, as well as reactions with the participation of components containing hydrogen. It is shown that use of the proposed chemical kinetics model and computation method make it possible to compute parameters of a distant wake more precisely than by the Schapker method. It is clearly demonstrated that in the interpretation of the results of ballistic measurements for measuring the intensity of chemiluminescent radiation and electron concentration in a distant air wake it is necessary that the influence of water vapor be taken into account. Author

N86-12660# Joint Publications Research Service, Arlington, Va.
DIFFRACTION OF INTERNAL WAVES DESCRIBED BY EQUATION OF SLIGHTLY STRATIFIED FLUID ON HALF-PLANE Abstract Only **c34**
A. T. Ismail-Zade *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 27-28 Transl. into ENGLISH from Izv. Akad. Nauk Azerb. SSR, Ser. Nauk o Zemle (USSR), no. 5, 1984 p 76-83 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

The diffraction of plane waves in a slightly exponentially stratified fluid on a plane barrier placed in this fluid was investigated. The problem is pertinent with respect to the study of internal waves in the ocean. The considered problem is regarded as highly unusual from the mathematical point of view because it is formulated as a boundary value problem for a hyperbolic equation with boundary conditions characteristic for elliptical equations. It was demontrated long ago that such a formulation is incorrect if only a limited region is examined but the problem is well formulated and has physical sense in the case of unlimited regions when there are appropriate conditions in the neighborhood of an infinitely distant point. The formulation and results are compared with a series of studies along these lines by S. A. Gabov, et al. It is shown that the diffraction pattern obtained with Beta squared yields O outside a restricted region differs qualitatively from the diffraction pattern examined by Gamov. Specifically, the neglecting of the term Beta squared U in the Klein-Gordon equation, employed by Gamov, gives erroneous results. Author

N86-12661# Joint Publications Research Service, Arlington, Va.
POSSIBILITY OF SOUNDING EARTH BY USING ELECTROMAGNETIC FIELD OF SEA CURRENT Abstract Only **c46**
V. P. Smagin, G. A. Fonarev, and V. N. Savchenko *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 29 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Zemli (Moscow), no. 2, Feb. 1985 p 70-74 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

The possibilities of determining the conductivity of bottom rocks by measuring different combinations of components of the electromagnetic field of a current on the ocean floor are analyzed. It is shown that the sea current induces an electromagnetic field in the geomagnetic field. Then a formula is derived for the magnetic component B. After determining B it is possible to find the electric field in sea water and in rocks beneath the ocean layer. The parameter epsilon is introduced which makes it possible to ascertain the vertical gradient of the magnetic field in bottom rocks; a function is derived which characterizes the magnetic field in the bottom rocks. Formulas are derived which can be used in estimating the width of a current by an electromagnetic method. It is shown, therefore, that with electromagnetic sounding in the fields of sea currents it is possible to make a simple interpretation of the experimental data within the framework of an exponential model of ocean floor conductivity. Author

N86-12662# Joint Publications Research Service, Arlington, Va.
ELECTROMAGNETIC FIELD OF THREE-DIMENSIONAL SURFACE SEA WAVES Abstract Only **c48**
V. V. Sochelnikov *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 29-30 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Zemli (Moscow), no. 2, Feb. 1985 p 65-69 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

Numerous attempts have been made to obtain estimates of the electromagnetic field of three-dimensional sea waves. Use has been made of hypothetical models with an eddy distribution of velocity through the entire fluid layer. Since these efforts have been largely unsuccessful, and effort was made to obtain a rigorous solution for the electromagnetic field of three-dimensional sea waves of wind origin. The same assumptions are made s for a model of a two-dimensional wave. First an expression is derived for the velocity of fluid particles, making is possible to proceed to the derivation of expressions for the induced electromagnetic field. It is shown that the induced electric field is a potential field. Formulas are then found that show that the induced electric field is not dependent on the conductivity of the ambient medium; the current does not flow into the bottom and therefore the magnetic field should not be dependent on bottom conductivity; the induced electromagnetic field is completely determined by the vertical component H sub Z (TJ-wave). All this is demonstrated and experessions are derived for the components of strength or the induced magnetic field. The induced magnetic field is dependent only on sea water conductivity. Since the EM field induced by three-dimensional sea waves is not dependent on bottom conductivity it cannot be used for its electromagnetic sounding. The induced field (as in the case of two-dimensional sea waves) is noise in electromagnetic research in the sea. Author

N86-12663# Joint Publications Research Service, Arlington, Va.
STRATIGRAPHY OF SEDIMENTS IN CENTRAL AND EASTERN MEDITERRANEAN Abstract Only **c46**
V. M. Sorokin, M. S. Afanasyeva, V. G. Kurenkova, and N. B. Chernyshova *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 30 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Ser. Geol. (Moscow), no. 2, Feb. 1985 p 59-64 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

In many parts of the Mediterranean there have been only limited stratigraphic studies. The least attention has been given to the near-shore portions of the Adriatic, Ionian and Levantian basins where sedimentation processes are typically most diverse and complex. A total of 57 cores of sediments with a length up to 6 m were obtained during cruises of the Akademik Pokrovski in 1973, 1979 and 1980. The cores were taken along profiles intersecting the continental slope and adjacent abyssal depressions. The sediments were broken down by a number of lithological and biostratigraphic methods, including study of plankton and benthos foraminifera, pollen and spores, sapropel and ash interlayers and textural varieties. Using a combination of micropaleontological and lithological methods which mutually supplement one another it was possible with a high degree of accuracy to discriminate the following horizons in the Late Quaternary deposits of the Central and Eastern Mediterranean: Riss, Riss-Wurm and Holocene. The results confirm the principles of stratification of Mediterranean sediments proposed by Olausson, Ryan and others. As illustrated in several graphs, the correlation of sections in the studied cores made it possible to plot the nature of change in the thicknesses of sediments in horizons of the same age within margins of the basin different in their tectonic position. Author

N86-12664# Joint Publications Research Service, Arlington, Va.
STRUCTURE OF ACOUSTIC FIELD IN DEEP SEA AT SHALLOW DEPTHS AND AT GREAT RANGES Abstract Only **c71**
V. S. Buslayev and M. V. Perel *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 32-33 Transl. into ENGLISH from Vestn. Leningr. Univ.: Fiz. Khim. (Leningrad), no. 22, Nov. 1984 p 9-17 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

A study was made of the structure of the acoustic field in a deep sea at shallow depths and with great ranges. The problem is formulated as follows. The field is examined in the half-space r = (x, y, z), z approximately > G. It is assumed that the water layer o approximately < z < h is situated over a hemogeneous underlying liquid half-space h < z (bottom). The acoustic field u = u(r) generated at the point by a harmonic source of the frequency f, situated at the point r sub O = (x sub O, y sub O, z sub O), is described by the equation delta u + p squared n squared u =

minus delta (c - r sub O), n = c sub star/c, p = 2 pif/c sub star, where c sub star is the minimum speed of sound c. It is also assumed that the speed of sound and density are dependent only on depth z; the speed of sound in the bottom is greater than the speed of sound in the water layer and bottom density is greater than water layer density. (The equation is supplemented by ordinary boundary conditions.) It is further assumed that the sea is deep and the speed of sound as a function of z has a single deeply situated minimum. An important characteristic of the medium is the function D (mu). It has a simple sense: it gives the horizontal period of the ray as a function of MU. Also examined is the structure of the acoustic field at such ranges where the convergence zone considerably overlap. Author

N86-12665# Joint Publications Research Service, Arlington, Va.
FIND OF RHEOLITES AND TRACHITES AND GEOLOGICAL SITUATION IN NORTHERN PART OF EAST INDIAN OCEAN SUBMARINE RIDGE Abstract Only **c46**
V. V. Reverdatto, V. V. Yeremeyev, A. Ya. Ilyev, A. A. Popov, P. M. Sychev, and V. N. Sharapov *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 34 Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 280, no. 4, Feb. 1985 p 960-963 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

Most studies of the geological structure of the Indian Ocean floor have suggested that the East Indian Ocean Ridge (90 deg. Ridge) developed as a transformed fault and that it is characterized by exclusively basic volcanism. Facts are presented which contradict this. Highly modified volcanic-sedimentary rocks were raised which can be classified as tuffites or tuff-siltstones. Clastic material is represented by fragments of relatively little-modified basalts, rhyolites, dacites and trachites, a small number of grains of quartz and plagioclase and particles of ferromanganese encrustations. The presence of rhyolites and trachites indicates that it is not basalts alone which are present in the East Indian Ocean Ridge; acidic and subalkaline effusives seem to be widespread. The association of basalts, rhyolites and trachites indicates an island arc nature of volcanism in the region. Situated to the east of the ridge is a trench with maximum depths greater than 6,000 m. In the northern part of the trench there is an increased thickness of sediments. The total crustal thickness within the ridge remains uncertain, but it is evidently not less than 23 km. The proximity of the ridge and trench and the nature of volcanism reveal a similarity to systems of island arcs and abyssal depressions in the Pacific Ocean. Author

N86-12666# Joint Publications Research Service, Arlington, Va.
EVALUATING SCREENING EFFECTS AND TUSNAMI DANGER IN BAYS Abstract Only **c46**
V. V. Ivanov, K. V. Simonov, and O. I. Garder *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 35 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atm. i Okeana (Moscow), v. 20, no. 12, Dec. 1984 p 1206-1214 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

In selecting sites for new construction in the Kuril Islands it is important to evaluate the tsunami danger of the pertinent parts of the coastline. Recommendations for the Kuril Islands have been published, but they are only preliminary. An effort has now been made to improve them by formulatating a more adequate model of the source with defining of those peculiarities of the specific position of a bay which exert the most significant influence on formation of the maximum tsunami wave in the analyzed coastal zone. The analysis was based on observational data for the Kamchatka tsunami of 1952, which was catastrophic for the shores of Kamchatka and the Kuril Islands. The data used were for Pearl Harbor, Honolulu and Hilo. The processing method involved breakdown of the record into the signal at the source and the impulse function for penetration of the wave into a bay. it was found that the record can be represented in the form of the convolution of the source function common for all the records of one tsunami and the specific impulse function for the propagation path specific for each bay. It was found that the signal at the tsunami source is a periodic process with beats of great duration with a relatively narrow spectrum. The impulse function for the paths for closed bays contains a small number of oscillations and varies in characteristic times on the order of 1 to 1.5 hours. The characteristic time of tsunami filling of a bay is important to know for shielding the bay against a tsunami wave.

N86-12667# Joint Publications Research Service, Arlington, Va.
INFLUENCE OF SESTON PHOSPHATASE ACTIVITY ON RATE OF PHOSPHORUS MINERALIZATION AND ITS RECYCLING IN PRODUCTION-DESTRUCTION CYCLE Abstract Only **c48**
A. I. Agatova, V. V. Sapozhnikov, and V. R. Vintovkin *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 36-37 Transl. into ENGLISH from Okeanol. (Moscow), v. 25, no. 1, Jan. - Feb. 1985 p 66-73 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

A study was made of the vertical distribution of organic phosphorus and phosphatase activity in the southeastern Pacific Ocean. The rate of the photosynthesis process is limited by the rate of freeing of phosphates in the regeneration process. In a normally functioning community of oligotrophic waters the most important role in the mineralization of phosphorus is played by microheterotrophs. In order to estimate the rate of phosphorus regeneration a study was made of the enzymatic activity of alkaline phosphatase and the protein content in seston, as well as a determination of organic phosphorus. A total of 290 synchronous determinations of organic phosphorus and the rate of phosphorolysis were made at 17 stations which take in the region of the open ocean along a 200-mile zone from 8 deg. S to Drake Passage. Comparison of the data indicates that the distribution of the total activity of phosphatase differs considerable both vertically and in dependence on the region. An estimate is made of the minimum times required for the recycling of phosphorus. In all the investigated regions in the layer 0 to 200 m the recycling of phosphorus occurs in the course of a 24-hour period. The contribution of mesoplankton to the recycling of phosphorus is less than in the case of microplankton, not only due to its lesser biomass, but also due to a lesser specific activity of phosphatase. Author

N86-12668# Joint Publications Research Service, Arlington, Va.
ORIGIN OF ELEMENT COMPOSITION OF OCEAN WATER Abstract Only **c48**
Yu. T. Chuburkov and I. A. Zotov *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 37 Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 280, no. 5, Feb. 1985 p 1234-1238 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

There is still no generally accepted theory on the origin of the salt composition of the ocean. It is most widely accepted that anions enter ocean water from the mantle, whereas cations enter with runoff from the continents. It is not possible to explain all experimental facts on that basis. The authors have derived a new expression which is useful in analyzing the element composition of ocean waters and world river runnoff, the objective of such an analysis being to clarify whether the salt composition of oceanic waters is a result of transport of elements from the continents or whether it is a product of differentiation of mantle matter. A table was prepared with data on the concentrations of elements in the ocean and in river runoff. It was found that the concentration of elements in both ocean and lake-river water is directly proportional to their volatilities. The cation composition of both types of water includes products of the outgassing of the earth's deep matter released as a result of its differentiation. The distribution of elements in the waters of the oceans and continents conforms to different patterns. At attempt can be made to explain this difference within the framework of concepts concerning the relative youthfulness of the oceans, formed primarily by the products of outgassing of the earth's deep matter in the process of its fluctuating development or expansion. In continental runoff waters, however, a significant contribution is from the products of rock destruction. Author

N86-12669# Joint Publications Research Service, Arlington, Va.
THEORY OF SOLITARY ANTICYCLONES IN ROTATING FLUID Abstract Only **c34**
G. G. Sutyrin *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 38 Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 280, no. 5, Feb. 1985 p 1101-1105 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

An experiment with a thin layer of fluid in a rotating parabolic vessel made it possible to produce long-live anticyclones called Rossby solitons. The laboratory studies were made with a considerable thickening of the fluid layer at the center of the eddy; in some cases the eddy scale was 2 to 3 times less than predicted by the theory of solitary low-amplitude waves. An effort has been made of explain this discrepancy. A study was made of a wave moving westward with the velocity u in a thin layer of rotating fluid. Equations are derived which describe solitary anticyclones moving to the west and low-amplitude waves. Analysis of the derived system shows that with a decrease in the phase velocity of a wave its amplitude decreases, the horizontal scale increases and theorbital velocity becomes close to geostrophic. It is shown that allowance for the finite amplitude of a solitary wave does not eliminate the discrepancy between theory and experiment. As a result of change in Coriolis force the eddy begins to be displaced westward. The anticyclone moves more rapidly than linear Rossby waves and can be transformed into a solitary wave. A cyclone moves more slowly than linear Rossby waves and as a result of generation of Rossby waves cannot be transformed into a stationarily moving solitary wave. The difference from an anticyclone is caused by a decrease in the level in the cyclone.
Author

N86-12670# Joint Publications Research Service, Arlington, Va.
NONLINEAR MODEL OF ADAPTATION OF FIELDS OF DENSITY AND CURRENTS IN SEA Abstract Only **c48**
Yu. L. Demin and D. I. Trukhchev *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 39 Transl. into ENGLISH from Izv Akad. Nauk SSSR: Fiz. Atm. i Okeana (Moscow), v. 20, no. 12, Dec. 1984 p 1171-1182 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

The fields of density, wind and sea floor relief determined from observations are usually inconsistent with one another and this often results in significant errors in computation of sea currents. Accordingly, the authors have formulated a new approach in order to ensure the hydrodynamic consistency of these fields while retaining the principal advantages of diagnostic computations. In the first stage purely diagnostic computations are made. Currents are computed on the basis of a priori stipulated density, wind and bottom relief fields. A quasigeostrophic model is used as well as a nonlinear model based on primitive equations of motion. In the second state, the adaptation stage, the system of equations and boundary conditions of the nonlinear diagnostic model are supplemented by a density diffusion equation with corresponding boundary conditions and using the initial density field and solution of the diagnostic problem as the initial approximation the computed density and current fields are brought into consistency with the observed wind and bottom relief fields. Having outlined this approach, the authors discuss the results of numerical computations carried out for the western part of the Black Sea, including the shelf zone. The studied region was covered by a uniform grid with a 5-mile interval and 12 horizons (0 to 1,800 m) were considered. The initial density field data were taken from a hydrological survey made in 1976. After illustrating the approach using these data, the results are compared with other models.
Author

N86-12671# Joint Publications Research Service, Arlington, Va.
LABORATORY STUDY OF REGULAR LOW-AMPLITUDE GRAVITY CAPILLARY WAVES IN NONSTATIONARY CURRENT Abstract Only **c34**
Ye. S. Benilov, K. V. Pokazeyev, and A. D. Rozenberg *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 39-40 Transl. into ENGLISH from Okeanol. (Moscow), v. 25, No. 1, Jan. - Feb. 1985 p 37-42 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

Laboratory experiments were carried out for study the change in wavelength, frequency and amplitude of regular low-amplitude gravity capillary waves in the range 2 to 5 Hz in a slow sinusoidal current with a velocity amplitude up to 10 to 15 cm/sec. The experiments were made in a glass flume measuring 670 x 20 x 40 cm. A nonstationary uniform current was simulated by movement of a measurement carriage (on which a wave generator and sensors were mounted) along rails. Three electrode sensors were situated at a distance of 5, 20 and 25 cm from the wave generator. The accuracy in determining frequency and amplitude was 10 and 20% respectively; the accuracy in measuring wavelength was 10%. The generation of a current, changing with tiem, resulted in a change in all the parameters of the waves. Data are given for two ranges of current velocities: 10 to 15 cm/sec and 20 to 30 cm/sec. All the observations fit well within the framework of a linear kinematic model. A control experiment with a motionless carriage and a countercurrent slowly changing with time confirmed the legitimacy of transfer of the data obtained with the carriage moving relative to calm water to the case of a uniform nonstationary current.
Author

N86-12672# Joint Publications Research Service, Arlington, Va.
EDDY FLUXES OF HEAT, VORTICITY AND MOMENTUM IN OCEAN AND ATMOSPHERE AND THEIR PARAMETERIZATION (REVIEW) Abstract Only **c48**
V. O. Ivchenko and A. V. Klepikov *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 40 Transl. into ENGLISH from Okeanol. (Moscow), v. 25, no. 1, Jan. - Feb. 1985 p 5-18 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

A critical evaluation is given of the present status of the theory of eddy transfer of momentum, heat and vorticity in the atmosphere and ocean. Despite differences in the regimes characteristic for the ocean and atmosphere, it is possible to analyze the principal ways to solve this problem on a common basis. Systematization of studies on the parameterization of vertical fluxes in macroscale circulation models suggests that four principal directions must be pursued; (1) obtaining asymptotic solutions for model situations; (2) use of a diffusional scheme for the parameterization of vertical fluxes; (3) studies of so-called orientation effects; and (4) derivation of expressions for the zonally averaged vertical flux of momentum. (This involves hypotheses related either to the baroclinic nature of eddy formation or interaction of baroclinic waves and determination of their phase velocity). Each of these directions (and the corresponding literature) is critically examined.
Author

N86-12673# Joint Publications Research Service, Arlington, Va.
STUDY OF INFLUENCE OF VERTICAL VELOCITY AND DENSITY PROFILES ON HYDRODYNAMIC STABILITY OF ZONAL FLOW Abstract Only **c34**
A. S Blatov and V. I. Ulyanova *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 41 Transl. into ENGLISH from Okeanol. (Moscow), v. 25, no. 1, Jan. - Feb. 1985 p 19-25 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

Within the framework of the linear theory of hydrodynamic stability and on the basis of a three-layer model of a zonal current with transverse velocity shear a study was made of the joint influence of curvature of the vertical velocity and density profiles on the parameters of unstable wave disturbances and the findings were compared with theoretical studies made earlier and data from in situ observations. The problem is formulated as follows: there is a three-layer macroscale current (with small Rossby-Kibel' numbers Ro $<<$ 1) on the Beta-plane not bounded along the longitudinal coordinate X, directed to the east, and having the width L along the transverse coordinate Y, directed to the north, with the Z axis being directed vertically upward. In this formulation a system of equations is derived which is free of shortcomings present in earlier attempts to solve this problem. This makes it

possible to study the influence of the vertical curvature of the density profile, related to the simultaneous existence of a seasonal thermocline and constant pycnocline, as well as the influence of curvature of the vertical velocity profile arising in the presence of subsurface velocity maxima. The system of equations is solved numerically. B.W.

N86-12674# Joint Publications Research Service, Arlington, Va.
FEATURES OF GEOSTROPHIC CIRCULATION RELATED TO NATURE OF BOTTOM RELIEF IN NORTHWESTERN ATLANTIC Abstract Only **c48**
Z. I. Kizner *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 4142 Transl. into ENGLISH from Okeanol. (Moscow), v. 25, no. 1, Jan. - Feb. 1985 p 26-31 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

A study was made of the influence exerted by bottom relief on a boundary current and the geostrophic circulation of the ocean in the neighborhood of its western shore. The investigation was made within the framework of the Ekman theory of wind currents in a barotropic ocean. The conditions characteristics for the northwestern shore was simulated; the sector from Florida to Georges Bank was considered. The modeling revealed that since to the north of Cape Hatteras the depth drops off smoothly from the abyssal plain to the outer edge of the shelf almost to zero, under some conditions the isolines of the f/H function (f is the Coriolis parameter, H is depth) near the continental slope can capture the geostrophic flow, making it virtually parallel to the edge of the shelf, this resulting in the weakening and disappearance of the western boundary current. There is little basis for expecting such a strong topographic effect as detachment under baroclinic conditions, which are clearly expressed in the subtropical latitudes, particularly near the western shore (baroclinicity to a considerable degree suppresses the bottom relief effect on current within the limits of the main thermocline). The described effect of capture of the geostrophic flow near the western shore is also possibly manifested in the South Atlantic. Author

N86-12675# Joint Publications Research Service, Arlington, Va.
CYCLONIC FRONTAL EDDY IN ANTARCTIC CIRCUMPOLAR CURRENT Abstract Only **c48**
Yu. A. Ivanov, A. Yu. Krasnopevtsev, Ye. G. Morozov, I. F. Shadrin, and A. D. Shcherbinin *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 42 Transl. into ENGLISH from Okeanol. (Moscow), v. 25, no. 1, Jan. - Feb. 1985 p 32-36 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

Studies of the Antarctic Circumpolar Current were made in December 1982-February 1983 on the 30th cruise of the Dmitriy Mendeleyev in the waters between New Zealand and Antarctica. Two hydrological surveys in the broad frontal zone of the current revealed a cyclonic eddy of the frontal type. The article discusses the structure and kinematics of the eddy and analyzes the nature of its evolution. This eddy could be traced in the field of all hydrological characteristics. Against a background of water with a temperature of about 6 C surrounding the eddy, the temperature at the center drops to 1.6 C. The horizontal scale of the ring can be determined from the peripheral closed isotherm. In the first survey the axes were 90 and 60 miles; in the second 80 and 50. During the time between the surveys (15 days) the center of the eddy moved 80 miles to the northeast, giving a velocity of 5.3 miles/day. The polar front separating the antarctic and subantarctic water structures possibly forms a meander extending to 58 deg S. The young ring discussed may have been formed as a result of separation of this quasistationary meander. The geostrophic velocities in the ring were computed by the dynamic method, the maximum values being 40 cm/sec. The two time-spaced surveys made it possible to compute the Lagrangian evolution of ring characteristics, specifically the available potential energy, heat and salt content. Author

N86-12676# Joint Publications Research Service, Arlington, Va.
INFLUENCE OF SOME OCEANOGRAPHIC CHARACTERISTICS ON DECAY KINETCIS OF SURFACE-ACTIVE AGENTS IN SEA Abstract Only **c45**
N. I. Ryasintseva, V. V. Malyshkina, and L. Yu. Sekundyak *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 45 Transl. into ENGLISH from Okeanol. (Moscow), v. 25, no. 1, Jan. - Feb. 1985 p 88-92 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

Those parameters which constitute conditions for the vital functioning of microorganisms, such as temperature, salinity, illumination and oxygen regime, play the decisive role in processes of destruction of surface-active agents. This article gives an experimental study of the role of these marine parameters in the process of biodegradation of surface-active agents. Two methods of model research were employed in the experimental work: static laboratory modeling in open and closed glass containers and the in situ method with polyethylene or polyvinyl chloride spheres exposed during the entire experiment in the sea and supplied with values and devices for taking samples. The object studied was the Progress washing compound, one of the most commonly used Soviet-produced surface-active agents, the active substance being sodium alkyl sulfate. In both the model and in the in situ experiments the rate of the process of decay of alky sulfates was monitored by a determination of their content in daily samples by the method of photo-colorimetry with methylene blue. A study of the kinetics of decay of alkyl sulfates in the temperature range from 0 to 36 deg revealed that at temperatures 0-2 C the biodestruction process is slowed down greatly. B.W.

N86-12677# Joint Publications Research Service, Arlington, Va.
COMPUTATIONS OF SEISMIC WAVE PROPAGATION VELOCITIES IN OCEAN BOTTOM SEDIMENTS FROM REFLECTED WAVES TRAVEL-TIME CURVES Abstract Only **c46**
V. N. Moskalenko, G. A. Semenov, and P. N. Kuzmin *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 46-47 Transl. into ENGLISH from Okeanol. (Moscow), v. 25, no. 1, Jan. - Feb. 1985 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

The velocity of seismic waves in a thin layer of sediments in the ocean is usually determined using the approximate Dix formula, but the latter has a number of limitations in large part attributable to its derivation. These limitations are reviewed. In its derivation use was made only of the first two even terms in the expansion of the travel-time curve for reflected waves. S. N. Medvedev found a more precise analytical expression for velocity which is derived using the first three terms of the expansion. The Medvedev algorithm, outlined in this article, was checked in a theoretical model and using experimental data obtained on the 28th cruise of the Dmitriy Mendeleyev. The Dobrinskiy program was used in solving the direct seismic problem for horizontally bedded thick layers with a constant velocity and theoretical travel-time curves were computed from the bottom of sedimentary layers of different thicknesses; these theoretical travel-time curves were then introduced into a program for the inverse seismic problem. It is shown that the Medvedev algorithm makes it possible to compute the stratum velocities of propagation of seismic waves in thin sedimentary layers of the ocean with an accuracy to 0.05 km/sec. B.W.

N86-12678# Joint Publications Research Service, Arlington, Va.
ROLE OF AHERMATYPIC CORALS IN SEDIMENTATION AND ECOLOGY OF CORAL BANKS Abstract Only **c48**
N. B. Keller *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 47-48 Transl. into ENGLISH from Okeanol. (Moscow), v. 25, no. 1, Jan. - Feb. 1985 p 113-116 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

Ahermatypic scleractiniae, not forming coral reefs, occur widely as individuals and in colonies, the skeletons in the latter being very similar to those of some hermatypic corals and being very difficult to distinguish from the latter in fossil form. Ahermatypic deep-water scleractiniae are adapted to different depths as great as 6,200 m and different temperatures down to -1.1 C. Locally in

the oceans they form dense colonies in the form of banks or coral overgrowths or meadows, in the latter case playing a significant role in the formation of sediments. Coral banks and overgrowths in fossilized form constitute calcareous bodies of sedimentary origin: bioherms up to 60 m thick and up to 3 km in extent; there are biostromes in the form of relatively thin lenses with an extent from tens to several hundreds of meters. A study was made to ascertain how the geologist can distinguish bioherms and biostromes of abyssal, cold-water origin from tropical zone bioherms and reefs. B.W.

N86-12679# Joint Publications Research Service, Arlington, Va.
NEW DATA OF RELIEF OF MAZCA RIDGE Abstract Only **c48**

L. A. Zakharov *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 48-49 Transl. into ENGLISH from Okeanol. (Moscow), v. 25, no. 1, Jan. - Feb. 1985 p 124-129 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

The Nazca Ridge is of particular interest because many aspects of the origin, development and structure of block-volcanic ridges as a whole do not fit in with the hypothesis of the tectonics of lithospheric plates. Four principal parameters were determined: slope, horizontal and vertical dissection, mean depth level. The Nazca Ridge, like the Walvis Ridge in the Atlantic, broken into large macroblocks: northern, central and southern. Each is distinctly different. The northern macroblock has a base at a considerable depth, minimum elevation and minimum vertical dissection. The central macroblock rises to the greatest elevations above the surrounding Peruvian and Chilean Basins, has considerable vertical dissection and a maximum slope steepness. There are mountains of typical volcanic characteristics, some with flat tops. The distinguishing characteristic of the southern macroblock is a predominance of mountains of volcanic origin, many of which are typical guyots, evidence of a relatively recent sinking of this part of the Pacific Ocean floor. B.W.

N86-12680# Joint Publications Research Service, Arlington, Va.
GRAVIMETRIC SURVEYING WITH MI-8 HELICOPTERS Abstract Only **c46**

V. Sopolev *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 52 Transl. into ENGLISH from Vozdushnyy Transport (Moscow), 18 Apr. 1985 p 4 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

A new type of geophysical operation--gravimetric surveying from MI-8 helicopters with the aid of suspended gravimeters--has been mastered for the first time in the country by Far East helicopter crews. In this method, all work is performed by an operator inside a helicopter carrying a gravimeter on an outside sling. The gravimeter is equipped with a stabilizing device. Work with the suspended gravimeter requires considerable flying skill and highly precise piloting during approaches and hovering. Author

N86-12681# Joint Publications Research Service, Arlington, Va.
MAGNETIC MINERALS AND CHARACTERISTICS OF NATURAL MAGNETIC STATE OF CORE IN SAATLY SUPERDEEP HOLE IN DEPTH RANGE 3500-7500 METERS Abstract Only **c46**

V. I. Bagin and Z. A. Novruzov *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 57 Transl. into ENGLISH from Izv. Akad. Nauk Azerb. SSR, Ser. Nauk o Zemle (USSR), no. 5, 1984 p 61-67 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

The SG-1 Saatly superdeep hole is one of the 15-km holes being drilled or which will be drilled for studying the deep structure of the earth's crust. This article presents data on magnetic minerals, carriers of natural remanent magnetization and determinations of the conditions under which they originated. Core rocks from depths of 3,500-7,500 m were used in the study. These are andesites, andesite-basalts, basalts, decites and others (a total of 120 samples were analyzed). Data on Curie temperatures (T sub C) and other parameters were analyzed in depth. The constancy of the composition of magnetic minerals (magnetite with T sub C = 575-585 C, magnetite with a low content of titanium with T sub C = 520-550 C and oxidized magnetite with T sub C = 600 C), found in the entire studied depth range, and its stability to temperature effects indicate not only a predominance of high-temperature oxidation, but also a constancy of conditions at the source of removal of the material. B.W.

N86-12682# Joint Publications Research Service, Arlington, Va.
NEW METHODS FOR INTERPRETING SEISMIC WAVES IN STRATIFIED MEDIA Abstract Only **c46**

B. N. Lutsenko *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 58 Transl. into ENGLISH from Geol. Nefti i Gaza (Moscow), no. 1, Jan. 1985 p 48-53 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

In order to ensure the most complete exploitation of petroleum deposits it is essential to develop new methods for the study of faults and the steep slopes of salt domes. The author describes a method for achieving this goal. This involves interpretation of reflections directly from fault zones: direct waves from the boundaries of fault zones and doubly reflected waves (those forming first by reflection from a subvertical boundary and then from the subhorizontal boundaries adjacent to them). It is shown that the formation of such duplex waves does not require that the entire subvertical boundary be continuously reflecting; it is only required that its individual elements in the neighborhood of the contacts with the subhorizontal boundaries have reflecting properties. The discrimination and interpretation of such waves is possible in virtually the entire range of studied depths for seismic prospecting and petroleum exploration and also in deep seismic soundings. Each of these possibilities is illustrated in examples. B.W.

N86-12683# Joint Publications Research Service, Arlington, Va.
NEW APPROACH TO SOME PROBLEMS IN SEISMOLOGY Abstract Only **c46**

I. G. Kerimov *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 58-59 Transl. into ENGLISH from Izv. Akad. Nauk Azerb. SSR, Ser. Nauk o Zemle (USSR), no. 5, 1984 p 41-46 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

Profound changes have occurred in seismology in recent years with respect to certain concepts which earlier had been unquestioned. Among these concepts are those regarding the pattern of distribution of earthquakes, the theory of propagation of weak high-frequency signals and the mechanism of induced seismicity. Each of these topics is discussed. It has been generally accepted that the curve of the dependence of the number of earthquakes on their magnitude has a shape close to a hyperbola: the stronger an earthquake, the less frequently it occurs. But 72% of all earthquakes are plotted in depth to depths of 400-450 km with an interval of 10 m earthquakes with M = 4.8-4.9 are most characteristic in all depth intervals. In such a distribution the stratification of the upper part of the Earth plays the most important role in a seismogenic sense. In seismogenic respect the Earth is homogeneous both over its surface and in depth. A study of weak seismc fields during the time directly preceding earthquakes has revealed definite amplitude and frequency changes in the process of preparation for the main earthquake tremor. B.W.

N86-12684# Joint Publications Research Service, Arlington, Va.
METHOD FOR SOLVING PROBLEMS IN ELECTRODYNAMICS OF ANISOTROPIC MEDIA WITH SLANT BEDDING Abstract Only **c32**

M. G. Savin *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 59-60 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Zemli (Moscow), no. 2, Feb. 1985 p 75-82 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

This is a further development of the methodology for solution of electrodynamic problems for the case of gradient anisotropic media when the axes of the medium form quite small angles with

the surface. This model approximates the geoelectric situation in the crystalline structures of the Baltic shield, where there is a contancy of the tilt of ancient rocks at angles from 45 to 60 deg to a depth of 11 km. The problem is examined in relation to work with pulsed magnetohydrodynamic generators. A geoelectric structure containing one-dimensional anisotropic layers is considered. The structure is assumed to be uniaxial, with the dielectric constant and magnetic permeability being continuous functions only of the z-coordinate. A method for solving electrodynamic problems is given for such media (the generalized functions method is employed). A fundamental solution is given for a system of Maxwell equations, represented in the for of a convergent series, whose terms are computed using recurrent formulas. Author

N86-12685# Joint Publications Research Service, Arlington, Va.
FEATURES OF FIELD OF DIRECTIONS AND VELOCITIES OF PROPAGATION OF FRACTURES AT EARTHQUAKE FOCI IN NORTHERN MUYA REGION OF BAYKAL RIFT ZONE Abstract Only **c46**
A. V. Solonenko and N. V. Solonenko *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 60 Transl. into ENGLISH from Vulkanol. i Seysmologiya (Moscow), no. 1, Jan. - Feb. 1985 p 98-105 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

In an earlier paper a method was formulated for determining the directions and velocities of propagation of fractures at the foci of earthquakes which is based on a joint analysis of their mechanism and the distribution of apparent periods at seismic stations in the region. The method has now been applied to the Baykal rift zone, specifically the Northern Muya region, within which there is an inversion of the field of directions of fracture propagation. The characteristics of this region are discussed in detail. In this area the velocities and directions of fracture propagation were determined at the foci of 247 earthquakes. In the analysis the data were classified into three groups: (1) hose foci at which the direction of fracture propagation has a westerly component; (2) those with an easterly component; (3) and those for which the direction of propagation could not be ascertained with certainty. The four characteristic zones were defined. These analyses revealed that the Northern Muya region is actually a place where there is a reorientation of the directions of fracture propagation. The change in direction occurs in the neighborhood of the Pereval'nyy fault. B.W.

N86-12686# Joint Publications Research Service, Arlington, Va.
HARDWARE AND SOFTWARE SUPPORT OF GEOLOGICAL-GEOPHYSICAL DATABASE Abstract Only **c82**
V. A. Ivanov, G. A. Ivanchenko, N. N. Karlson, and N. S. Yakovenko *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 68 Transl. into ENGLISH from Avtometriya (Novosibirsk), no. 6, Nov. - Dec. 1985 p 82-83 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

The greatest difficulty in processing of geological and geophysical data on computers is that of representing the data on punch cards. The first version of a geological-geophysical database and the software which allows input and output, storage, editing and analysis of the data jointly with pictures is described. Coded graphic information is transferred from cards to magnetic tape and output is through a plotter. The objects in the database are various points on coded maps. An object has three attributes: a characteristic (reference point, isoline, profile, linearment, etc.), value of geological-geophysical quantity (e.g., temperature borehole) and coordinate of the point coded. The database is physically kept on 7.5-Mb magnetic disks using FMS-10 and FMS-D file management systems under DOS-10 on a YeS-1010 minicomputer. The first part of the geological-geophysical database allows coding, storage and editing of geological-geophysical maps, reduction of the maps to a common topographic base, as well as geometric transformation of photographic images to the same topographic base, allowing work to be started on combined analysis of data and photographs. Author

N86-12687# Joint Publications Research Service, Arlington, Va.
HIGH-ELEVATION STATION'S COSMIC-RAY RECORDING SYSTEM Abstract Only **c93**
In its USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 71 Transl. into ENGLISH from Izv. (Moscow), 5 Apr. 1985 p 3 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

Scientists of the high elevation cosmic ray station of the Kazakh Academy of Sciences' Institute of High-Energy Physics have begun their first experiments for recording cosmic particles with a new automated system, the Adron-44. The Adron-44 is a unique complex which was developed by physicists of Kazakhstan. It is located at the Tien-Shan High-Elevation Station in the Zailiyskiy Ala-Tau Mountains, at an elevation of 3,400 meters above sea level. Experiments at the cosmic ray station will make it possible to obtain new information on processes of the interaction of cosmic-radiation particle with matter. Author

N86-12688# Joint Publications Research Service, Arlington, Va.
VIDEO TERMINAL FOR ANALYZING AERIAL INFRARED PHOTOGRAPHS Abstract Only **c35**
In its USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 72 Transl. into ENGLISH from NTR: Probl. i Resheniya (Moscow), 5-18 Mar. 1985 p 2 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

A Self-Contained Video Information Terminal (SVIT) was developed at the USSR Academy of Sciences' Institute of Space Research in collaboration with the Kirov Polytechnical Institute. Equipment and methods which were developed at IKI for digital processing of images are finding employment in various fields of science and the economy, particularly in the solution of problems of mapping temperature patterns of the Earth's surface and atmosphere. A photograph showing a fragment of an infrared portrait of a city that was produced on the screen of the SVIT is given. Clearly distinguishable against a dark background are spots of light with different degrees of brightness: a power-and-heating plant with five cooling towers, a heat-transport line running from this plant, and a waste-water discharge channel. The SVIT is capable of subdividing an image into 256 digital gradations. Author

N86-12689# Joint Publications Research Service, Arlington, Va.
COMPARISON OF SINGLE-PARAMETER STATISTICAL MODEL WITH RESULTS OF ROUND-THE-CLOCK MEASUREMENT OF LIGHT-SCATTERING MATRICES Abstract Only **c46**
M. A. Sviridenkov, G. I. Gorchakov, A. A. Isakov, and V. N. Sidorov *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 73 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atm. i Okeana (Moscow), v. 21, no. 1, Jan. 1985 p 22-31 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

A statistical model proposed previously is shown to agree with the results of round-the-clock measurements of light scattering over a range of 2 to 50 km. Exceptions include extreme situations such as dust storms. The single parameter model results from uniform matched transformations of angular variations in scattering matrix components with changes in the visibility range due to two main factors, condensation transformation of the distribution of particles by size and changes in the refractive index, including heterogeneous condention of volatile vapors, plus changes in the relative contribution of molecular scattering. The statistical model can be corrected for individual data sets by considering the mean particle concentration. At long ranges the model becomes inadequate to the observed variability in light scattering characteristics due to noncondensational processes of transformation of aerosol and the dry aerosol base, leading to significant variations in concentration. Author

N86-12690# Joint Publications Research Service, Arlington, Va.
IONIC MECHANICSM OF EXCHANGE OF ADMIXTURES BETWEEN HYDROSPHERE AND ATMOSPHERE Abstract Only **c46**
A. V. Savchenko and V. V. Smirnov *In its* USSR Rept.: Earth

Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 74 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atm. i Okeana (Moscow), v. 21, no. 1, Jan. 1985 p 32-41 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

Experiments conducted are used as the basis for a proposed quantitative model of evaporation which takes into account the microphysical and macrophysical characteristics of an ionogenic solution and the surrounding gas medium. Certain practical applications to real atmospheric processes are discussed. The experiments are based on observations of alteration of the charge exchange spectrum of an evaporated liquid-drop aerosol and changes in polar conductivities of the surrounding air. The possible contribution of the mechanism to transfer of ions in the atmosphere immediately above the ocean, in fog and clouds is studied. Author

N86-12691# Joint Publications Research Service, Arlington, Va.
IONIC MECHANICSM OF EXCHANGE OF ADMIXTURES BETWEEN HYDROSPHERE AND ATMOSPHERE Abstract Only **c74**
A. V. Savchenko and V. V. Smirnov *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 74 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atm. i Okeana (Moscow), v. 21, no. 1, Jan. 1985 p 32-41 Original language document was announced in IAA as A85-26294 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

Image quality as a function of the scattering-medium layer position relative to the shelf-luminous object under observation is experimentally studied for purposes of aerial and space photography and television. The laboratory environment consisted of a 6-m long light path with a fluoroplastic film (50 microns thick) as a scattering medium. The experimental data are shown to be in agreement with theoretical conclusions based on the linear-system theory. The large discrepancies among the previous studies on the subject are suggested to be caused by the disregard of distortion of the Fourier-transformed image function resulting from the finiteness of the receiver sighting angle in an optical system. L.T.

N86-12692# Joint Publications Research Service, Arlington, Va.
DAMPING OF HIGH-FREQUENCY WIND WAVES BY ARTIFICIAL SURFACE-ACTIVE FILMS Abstract Only **c45**
S. A. Yermakov, A. R. Panchenko, and T. G. Talipova *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 74 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atm. i Okeana (Moscow), v. 21, no. 1, Jan. 1985 p76-82 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

Field experiments with artificial slicks made of surface-active agents have shown that in areas covered by such films the intensity of wind waves decreases greatly over a broad frequency range. The damping of high frequency wind waves in small artificial slicks on the order of ten meters in diameter is studied. Experiments were performed along the Black Sea coast from an oceanographic platform with winds of up to about 6 m/s. A resistance-type string wave recorder was used to measure wave heights. The high frequency (over 2 to 3 Hz) component of wind waves was sharply reduced by the artificial surface active slick. With very weak winds, the contrast in the high frequency portion of the spectrum is well described by a theoretical curve in which the major factor involved is the effect of direct dissipation of surface waves resulting from the presence of the elastic surface active film. As wind speed increases to about 6 m/s the mean contrast in the gravity capillary range of frequencies monotonically approaches 1, that is the damping effect of the film decreases. Author

N86-12693# Joint Publications Research Service, Arlington, Va.
ORGANIC COMPONENTS IN ATMOSPHERE IN REGIONS OF VOLCANIC ACTIVITY Abstract Only **c45**
V. A. Isidorov and I. G. Zenkevich *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 75 Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 280, no. 1, Jan. 1985 p 223-227 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

Model experiments and thermodynamic calculations indicate the possibility of formation of a broad range of volatile organic components in volcanic processes. In September and October 1983, the air in the region of active volcanoes on Kunashir Island was sampled, performing mass spectrometric and gas chromatographic analysis. Fifty-eight organic compounds detected in the air samples are listed. Benzene was present in the greatest quantity. The analyses agreed with model experiments involving abiogenic synthesis of organic compounds under conditions simulating volcanic activity and indicate the presence of natural sources of fluorochlorohydrocarbon which must be considered in estimating the influence of halogen-containing organic compounds on the status of the earth's ozone layer. Author

N86-12694# Joint Publications Research Service, Arlington, Va.
EVALUATING INFLUENCE OF WAVES ON DYNAMIC STRUCTURE OF ATMOSPHERIC NEAR-WATER LAYER Abstract Only **c46**
K. L. Yegorov *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 76 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atm. i Okeana (Moscow), v. 20, no. 12, Dec. 1984 p 1183-1188 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

A possible clarification was sought by an analysis of the possible qualitative influence of the wave covered ocean surface on the vertical profile of the characteristics of turbulence at the interface on the basis of known hypotheses of the semiempirical theory of turbulence. Specifically, on the basis of solution of the equation for the balance of turbulent energy a study is made of the stationary turbulence regime in a flow with a velocity shear near the wave covered surface, taking into account the diffusion of the kinetic energy of turbulence from the wave layer in the case of a neutral stratification. The solution is analyzed using a generalized Karman model for the mixing path. This gives evidence of the possibility of existence of conditions characterized by a decrease in the turbulence coefficient with increasing distance from the surface. The computed wind velocity field is compared with observational data. It is shown that the peculiarities observed in structure of the atmospheric near-water layer can be qualitatively correctly taken into account by setting boundary conditions different from conditions over the land and assuming an exchange of turbulent energy between the wave layer and the air flow. Author

N86-12695# Joint Publications Research Service, Arlington, Va.
GLOBAL MODELING OF OPTICAL CHARACTERISTICS OF ATMOSPHERIC AEROSOL Abstract Only **c45**
K. Ya. Kondratyev, N. I. Moskalenko, S. Ya. Skvortsova, A. R. Zakirova, F. S. Yakupova, and S. V. Gusev *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 76-77 Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 280, no. 5, Feb. 1985 p 1090-1093 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

A system for the global modeling of the optical characteristics (OC) of atmospheric aerosol (AA) is proposed. The global structural model of AA is based on a map of the earth's natural landscapes, the temperature field of the underlying surface or the temperature of the surface air layer and the zonal and meridional components of wind velocity. At the basis of the model are the background aerosol and disturbed layers of the zone of active turbulent heat exchange (ZATHE), banded transport of the dust aerosol of the middle troposphere and volcanic stratospheric aerosol. The model is analyzed. Roughly speaking, the global monitoring of OC of AA is possible on the assumption that the optical density of AA over the land in the ZATHE zone is constant. Over the sea surface allowance must be made for the effect of wind velocity on the vertical profile of optical density in the ZATHE. Optical models of AA can be based on a data bank of OC for different AA fractions with different microstructure and chemical composition. The modeling of OC of AA revealed that the greatest optical thickness

of AA is observed at the hottest time of the year and in the warmest zones when the ZATHE altitude attains 4 km and the optical thickness of AA is approx. 0.3 to 0.4. The most transparent atmosphere is in the cold season when ZATHE altitude is minimum and the optical thickness decreases to 0.01 to 0.03. Author

N86-12696# Joint Publications Research Service, Arlington, Va.
DIURNAL VARIATION OF OPTICAL AND MICROPHYSICAL CHARACTERISTICS OF NEAR-SURFACE AEROSOL Abstract Only **c45**
V. N. Sidorov, G. I. Gorchakov, A. S. Yemilenko, and M. A. Sviridenkov *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 78 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atm. i Okeana (Moscow), v. 20, no. 12, Dec. 1984 p 1156-1165 Original language document was announced in IAA as A85-20831 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

Inverted optical data are used to determine the average diurnal behavior of the physical parameters of the near-ground aerosol: the in-situ light-scattering coefficient; the light-scattering coefficient for a dry aerosol; and some microstructural parameters. It is shown that the fundamental behavior of diurnal optical aerosol parameters is dominated by the condensational transformation which occurs as a result of changes in relative humidity, and by the local processes of aerosol accumulation and removal in the surface layer. The accumulation of aerosol dry matter mass during the night is associated with particle growth, while day-time accumulation is marked by an increase in submicorn aerosol concentrations. I.H.

N86-12697# Joint Publications Research Service, Arlington, Va.
USSR REPORT: EARTH SCIENCES
16 Aug. 1985 57 p Transl. into ENGLISH from various Russian articles
(JPRS-UES-85-008) Avail: NTIS HC A04/MF A01

Numerous topics in earth sciences relating to meteorology, oceanography, geophysics, atmospheric physics and polar regions are discussed. Water waves, tectonics, geodynamics, solitary waves, volcanoes, clouds, air-water interactions and remote sensing are discussed. For individual titles, see N86-12698 through N86-12737.

N86-12698# Joint Publications Research Service, Arlington, Va.
SOME RESULTS OF STUDY OF BLOCKING LAYERS ON DAYS WITH VERTICALLY DEVELOPED CLOUD COVER OF CAUCASUS-CASPIAN REGION ON BASIS OF AEROSPACE INFORMATION Abstract Only **c47**
A. A. Gorchiyev and T. D. Agayev *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-008) 16 Aug. 1985 p 1 Transl. into ENGLISH from Izv. Akad. Nauk Azerbaydzhanskoy SSR, Ser. Nauki o Zemle (USSR), no 6, 1984 p 111-118 (For primary document see N86-12697 03-42)
Avail: NTIS HC A04/MF A01

A study of vertically developed clouds (Cu and Cb) in the presence of blocking layers was made using surface and aerological data for the period 1958 to 1980 and space photographs (1974 to 1980). The investigations covered the Causasus-Caspian region. It was found that blocking layers are present in 70% of the cases when vertically developed Cu and Cb are observed over the Apsheron Peninsula. In more than 60% of all cases the lower boundary of the blocking layers is in the layer 0.5 to 2.0 km. The lower boundary of Cu is formed in the atmospheric layer 800 to 1,500 m and Cb in the layer 400 to 1,000 m. The thickness of Cu varies from hundreds of meters to several kilometers, whereas Cb can vary from a kilometer to several kilometers, sometimes reaching the tropopause. Over the Apsheron Peninsula Cu and Cb are most frequently formed in cold and moist air masses arriving from the north. The velocities of their intrusion are 5 to 15 m/sec respectively. Near midday such types of clouds can cover from several percent of the heavens to 70 to 80%; the horizontal dimensions of individual clouds may be several hundreds of meters to 2 to G km. During summer-autumn a breeze circulation makes a definite contribution to the formation of cumulus clouds. Author

N86-12699# Joint Publications Research Service, Arlington, Va.
EXPERIMENTAL STUDY OF EQUILIBRIUM INTERVAL IN FREQUENCY SPECTRA OF WIND WAVES IN SEA OF FINITE DEPTH Abstract Only **c48**
I. A. Alekperov, N. I. Akhmedov, A. I. Gumbatov, A. S. Ismaylov, S. G. Magerramova, and T. M. Tatrayev *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-008) 16 Aug. 1985 p 6 Transl. into ENGLISH from Izv. Akad. Nauk Azerbaydzhanskoy SSR, Ser. Nauki o Zemle (USSR), no. 6, 1984 p 119-123 (For primary document see N86-12697 03-42)
Avail: NTIS HC A04/MF A01

The frequency spectrum is one of the most important characteristics of surface wind waves, making it possible to compute the mean elements of waves such as mean height, dispersion, mean period and energy of waves. However, determination of the form of the spectrum has remained an essentially unsolved problem. Along these lines the Phillips equilibrium hypothesis on the form of frequency spectra has gained the widest acceptance (in wind wave spectra these are some frequency intervals in which the energy distribution should be dependent only on the physical parameters characterizing the formation of sharp crests and collapsing waves). Data is given on the frequency spectra of surface wind waves obtained at different wind velocities for a depth of 7 m. The measurements were made in the Caspian Sea in August 1983. An analysis revealed the legitimacy of use of the Phillips and Kitaigorodskii formulas in the range of relatively low frequencies, but there are deviations in the range of high frequencies (f approximately $>$ 0.5). Any final solution of the problem requires a thorough study of smell and currents jointly with surface wind waves. Author

N86-12700# Joint Publications Research Service, Arlington, Va.
FEATURES OF ELECTRICAL MEASUREMENTS IN SEA AS MEDIUM WITH FIELD OF EXTRANEOUS FORCES Abstract Only **c48**
V. I. Loptnikov *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-008) 16 Aug. 1985 p 7 Transl. into ENGLISH from Geofiz. Zh. (Kiev), v. 7, no. 7, Mar. - Apr. 1985 p 59-68 (For primary document see N86-12697 03-42)
Avail: NTIS HC A04/MF A01

Electrical measurements in the sea involve both theoretical and technical difficulties because in any part of the sea there may be electrical fields generated by different sources but having a close spectral makeup. These include the telluric field associated with variations of the earth's electromagnetic field, extraneous and electrostatic fields associated with physicochemical processes and fields of biological, industrial and other origin. Electrical fields of dynamic origin determined by the Lorentz force are excited in the sea moving relative to the geomagnetic field. In addition, the measurement instruments themselves frequently have their own undermined motion in which a Lorentz force and undetermined emf can arise directly in moving parts . Different possibilities for discriminating or excluding the effects of motion under specific conditions are discussed by the vertical stratification of water masses. Various types of electrical field transducers are examined. The organization of electrical field measurements in a reference system fixed relative to the earth and the results of use of transducers of different types are also discussed. It is shown that within the framework of the electrodynamics of slowly moving media there is a possibility not only of using, but also excluding the electrical effects of movement in the magnetic field. The conclusions presented serve as a basis for different methods for measuring the electrical field in the sea when carrying out magnetotelluric soundings, invesgigating currents and the vertical physiocochemical stratification of water masses. Author

N86-12701# Joint Publications Research Service, Arlington, Va.
PHASE OPERATOR METHOD IN PROBLEM OF SCATTERING OF ELECTROMAGNETIC WAVES ON IDEALLY CONDUCTING SURFACE Abstract Only **c32**
A. G. Voronovich *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-008) 16 Aug. 1985 p 7-8 Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 282, no. 2, May 1985 p 286-290

(For primary document see N86-12697 03-42)
Avail: NTIS HC A04/MF A01

Use of an S-matrix is common in a theoretical description of the scattering of electromagnetic waves on irregular surfaces because it relates the amplitudes of the incident and scattered waves. In an earlier article by the author (DAN, Vol 272, No 6, pp 1351-1355) it was proposed that a theory of perturbations be developed not relative to the scattering matrix itself, as is usually done, but relative to its logarithm. It was shown that with such an approach even the first approximation gives results corresponding to the first two approximations in the traditional perturbation theory. The approach proposed in that article is now applied to the problem of scatteing of an electromagnetic wave on an ideally conducting surface: a monochromatic electromagnetic wave of a stipulated frequency is incident on this surface from above, this surface consisting of plane (uniform and nonuniform) waves. A scattering matrix is formed for vertically and horizontally polarized waves for such a surface, as well as a matrix which the author calls a phase operator. With this as a point of departure, a final form of the scattering matrix is proposed for the first approximation (which can be used in subsequent approximations). Not only is a solution of the formulated problem obtained, but the advantageousness of the proposed approach over traditional perturbation theory is demonstrated. Author

N86-12702# Joint Publications Research Service, Arlington, Va.
QUASIGEOSTROPHIC MODEL OF CIRCULATION IN ANTARCTIC OCEAN WITH PARAMETRIZATION OF SYNOPTIC EDDIES Abstract Only **c48**
V. O. Ivchenko and A. V. Klepikov *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-008) 16 Aug. 1985 p 8 Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 281, no. 4, Apr. 1985 p 944-948 (For primary document see N86-12697 03-42)
Avail: NTIS HC A04/MF A01

Prognostic models of large-scale oceanic circulations require correct parametrization of synoptic scale disturbances, particularly for zonal currents such as the Antarctic Circumpolar Current. Traditional semiempirical closure hypotheses generally do not reflect the interaction of large-scale fields with synoptic eddies. Previous works have demonstrated the correctness of the diffusion parametrization for the adiabatic invariant potential eddy. The major feature of this approach is averaging of tensor components k sub ij. This tensor, characterized by four components, can be represented as the sum of symmetric and anti-symmetric parts, the latter related to the so-called orientation effects, i.e., the systematic rotation of fluid elements. Only the diagonal components of the k sub ij tensor are studied. The calculations confirm that in the region of the major zontal jet, the Sverdrup balance is not satisfied. The vertical component of the tangential wind stress rotor is balanced by divergences in the upper layer of the wind flow of the potential eddy. In the lower layer an analogous eddy flow is balanced by friction with the bottom. Author

N86-12703# Joint Publications Research Service, Arlington, Va.
ESTIMATION OF INFLUENCE OF OCEAN ON DISTRIBUTION OF HEAVY METALS IN MARINE ATMOSPHERE Abstract Only **c45**
V. V. Anikiyev, V. I. Ilichev, A. A. Lobanov, and A. N. Medvedev *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-008) 16 Aug. 1985 p 9 Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 281, no. 4, Apr. 1985 p 937-940 (For primary document see N86-12697 03-42)
Avail: NTIS HC A04/MF A01

The degree of enrichment of the surface microlayer with dissolved and suspended forms of Fe, Mn, Cu and Zn was determined at nineteen stations in various areas of the Pacific Ocean. The enrichment factors for the elements were calculated as the ratio of concentrations of dissolved and suspended forms of the heavy metals in the surface microlayer 250 microns thick and at a depth of 0.5 m. Total fluxes of metals from the ocean and factors of their enrichment in the atmosphere were calculated considering the possibility that the surface of the ocean is covered with an unsaturated surfactant monolayer. The influence of the ocean is found to be insufficient to explain the distribution of metals in the maritime atmosphere. Author

N86-12704# Joint Publications Research Service, Arlington, Va.
FOLDED STRUCTURES IN CENTRAL INDIAN OCEAN TRENCH Abstract Only **c46**
O. V. Levchenko, L. R. Merklin, and Yu. P. Neprochnov *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-008) 16 Aug. 1985 p 10 Transl. into ENGLISH from Geotektonika (Moscow), no. 1, Jan. - Feb. 1985 p 15-23 (For primary document see N86-12697 03-42)
Avail: NTIS HC A04/MF A01

Continuous seismic profiling of the central Indian Ocean trench was performed during the 58th cruise of the research vessel Vityaz in 1976, revealing large folded structures to the north of the trench and a zone of deformation of the sedimentary mass and basement at 5 to 7 S. Analysis of the continuous profiling data from this and two other cruises is used in this article to define the area of folded deformations with a northeasterly strike in the sedimentary mass. The tectonic structure of the deformed zone is discussed. The deformation area is tilted relative to the general submeridional (north-northwest) direction of existing stresses. It is postulated that there is a large shear zone with a northeasterly strike to the north of the Indian-Australian plate. Author

N86-12705# Joint Publications Research Service, Arlington, Va.
REMOTE DIAGNOSIS OF MEDIA BY COMBINATION (RAMAN) ANTI-STOKES LIGHT SCATTERING METHOD WITH INDUCED BRILLOUIN BACKSCATTERING Abstract Only **c74**
A. F. Bunkin, D. V. Vlasov, and A. S. Galumyan *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-008) 16 Aug. 1985 p 10-11 Transl. into ENGLISH from Kvantovaya Elektron. (Moscow), v. 12, no. 3, Mar. 1985 p 619-621 (For primary document see N86-12697 03-42)
Avail: NTIS HC A04/MF A01

An examination is made of the possibilities of remote sensing of the sea surface by raman spectroscopy. A modification of the method suitable for remote measurements was proposed earlier by the authors (A. F. Bunkin, et al., KVANTOVAYA ELEKTRONIKA, 10, 669, 1983; 10, 1902, 1983). In the proposed method the pumping wave is excited in the medium due to induced backscattering, especially induced Brillouin backscattering. With this taken into account, a general case of a nondegenerate scheme for remote measurements is described. In contract to the cases examined in the articles cited above, in which the minimum angles ensuring synchronism of the interacting waves were great, here it is shown that the angles can be as small as desired and collinear interaction is also possible. Developing these ideas, it is demonstrated that remote measurements can be made of the surface of water bodies by the methods of four-photon nonlinear spectroscopy of combination (Raman) scattering when there are small and zero angles between the interacting waves. Author

N86-12706# Joint Publications Research Service, Arlington, Va.
ACOUSTIC METHODS FOR FEATURING HIGH-FREQUENCY PART OF SPECTRUM OF SEA WAVES Abstract Only **c71**
G. Yu. Narodnitskiy *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-008) 16 Aug. 1985 p 11 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atm. i Okeana (Moscow), v. 21, no. 4, Apr. 1985 p 443-446 (For primary document see N86-12697 03-42)
Avail: NTIS HC A04/MF A01

Measurements of the spectrum of ripples are very difficult. Possible approaches to solution of this problem are outlined. Some integral characteristics of ripples can be measured by acoustic methods with vertical pulsed sounding of the surface provided that the linear dimensions of the irradiated sector are small in comparison with the length of large sea waves. The rms value for ripple slopes can be measured by the synchronous registry of the slopes of large waves and the intensity of backscattered ultrasonic signals. Methods for measuring the rms values of ordinates and vertical velocities of ripples are based on use of the correlation between these parameters and the corresponding frequency and time correlation intervals of fluctuations in the amplitude of

backscattered ultrasonic signals. With the earlier work on this problem taken into account, revised formulas are derived for determining the rms values for the ordinates and vertical velocities of ripples. Measurements of the characteristics of ripples when a vertical sounding transmitting-receiving system was situated at a height of about 7 m above the mean level of a water body are described. The frequency of the used ultrasound was about 40 KHz (wavelength 8 mm); the diameter of the irradiated sector at the 3-db level was 0.2 m. The formulas and methods given are applicable in measurements from scientific research ships and the rms values for ordinates and slopes of ripples can be measured either at drift or while a vessel is proceeding on course. Author

N86-12707# Joint Publications Research Service, Arlington, Va.
OCEAN ALBEDO FOR ATMOSPHERIC THERMAL EMISSION Abstract Only **c48**
R. G. Gardashov, Zh. K. Zolotova, and K. S. Shifrin *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-008) 16 Aug. 1985 p 12 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atm. i Okeana (Moscow), v. 21, no. 4, Apr. 1985 p 438-440 (For primary document see N86-12697 03-42)
Avail: NTIS HC A04/MF A01

In computations of components of the radiation budget of the ocean its surface albedo for atmospheric thermal emission chi is assumed equal to (1 - epsilon), where epsilon is surface emissivity, although in actuality chi approx. equals (1-epsilon). A study was made for evaluating chi under some mean standard conditions. It is assumed that the brightness of thermal emission of the sky B and surface albedo for direct radiation A subs are not dependent on azimuth (B = B((Theta, lambda) and A sub s = A sub s (theta, lambda), where theta is zenith distance, lambda, is wavelength). If B (theta, lambda) is replaced by the Planck function B sub O (T sub w, lambda) with the water surface temperature T sub w, the chi value is equal to chi prime = 1 - epsilon. The theta values were computed earlier. Atmospheric emission in the range 7 to 15 microns was determined using the formula beta (theta, lambda) = B sub O (T sub w, lambda) - f (theta, lambda). Albedo A sub s (theta, lambda was computed in the approximation of the stochastically distributed areas method with different wind velocities and with allowance for shading. Computations were made in the spectral range 2.5 to 250 microns. The results of chi computations for a cloudless atmosphere are given in a table. Computations are also given for a continuous cloud cover. The chi values for a partial cloud cover can be obtained by interpolation. A formula is derived for effective emission of the ocean, based on the difference between chi and chi prime. A correction is introduced to take into account the influence of a cold film on the sea surface. Author

N86-12708# Joint Publications Research Service, Arlington, Va.
INVESTIGATION OF ELASTIC PROPERTIES OF MARINE SURFACE-ACTIVE FILMS Abstract Only **c48**
B. T. Demin, S. A. Yermakov, Ye. N. Pelinovskiy, T. G. Talipova, and A. I. Sheremetyeva *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-008) 16 Aug. 1985 p 12-13 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atm. i Okeana (Moscow), v. 21, no. 4, Apr. 1985 p 410-416 (For primary document see N86-12697 03-42)
Avail: NTIS HC A04/MF A01

The dependence of the elasticity parameter of films on wind velocity, the film relaxation effect and the dependence of the film elasticity parameter on the concentration of surface-active agents were studied. The measurements were made from an oceanographic platform in the coastal zone of the Black Sea in the autumn of 1981 and 1982. The apparatus used in measuring film parameters is described. It was found that the film elasticity parameter and the surface-active agent concentration on the average decrease with an increase in wind velocity to V approximately equals 5 to 6 m/sec. An increase in these parameters is observed when there are stronger winds. The results obtained by Huhnerfuss and Garrett on a change in the properties of films with time were confirmed. the film relaxation time increases with an increase in wind velocity. There is a good correlation between the film elasticity values and the concentration of surface-active agent. It is emphasized that these conclusions are based on the results of measurements of sea films in the coastal zone and such investigations must be made in the open ocean. Author

N86-12709# Joint Publications Research Service, Arlington, Va.
STRUCTURE OF SEDIMENTARY COVER AND BASEMENT OF SIERRA LEONE RISE DETERMINED FROM COMMON DEPTH POINT SEISMIC (EQUATORIAL ATLANTIC) Abstract Only **c46**
V. I. Kara, K. N. Mamoshina, and A. Ye. Shlezinger *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-008) 16 Aug. 1985 p 14 Transl. into ENGLISH from Geotektonika (Moscow), no. 3, May - Jun. 1985 p 38-49 (For primary document see N86-12697 03-42)
Avail: NTIS HC A04/MF A01

A thorough study of the Sierra Leone Rise was made in 1979 by geophyiscal methods, including seismic work by the common depth point method, along runs with a total length of 2,00 km. This rise consists of two morphologically different sectors separated by a troughlike valley with an E to W orientation; the rise is separated from the continental margin of Africa by the basin of the same name. Crustal thickness within the rise is 13 km. The crustal section consists of a lower basalt layer with a thickness up to 8 km and a layer with densities 2.5 to 2.6 g. cubic centimeter with a thickness up to 5 km. In the basin the thickness of the consolidated crust does not exceed 6 km and belongs to the basalt layer. An analysis is given of bedding conditions, thicknesses and seismogeological characteristics of the sedimentary layers (deep drilling data are also used). It is concluded that the Sierra Leone Rise is a major volcanic shield with a total thickness as great as 4,000 to 5,000 m, overlying a melanocratic basement. In some sectors, outpourings continued up to the Early Quaternary, resulting in formation of underwater volcanic mountains. The region became divided into uplifted and subsided sectors by the beginning of the Late Cretaceous. Subsequent volcanic activity occurred primarily in the rise. The structural plan of the present-day bottom of the rise was doubtlessly formed by Quaternary post-sedimentation differentiated descending tectonic movements. Author

N86-12710# Joint Publications Research Service, Arlington, Va.
TECTONIC STRUCTURE OF SHIRSHOV RIDGE (BERING SEA) Abstract Only **c46**
Yu. P. Neprochnov, V. V. Sedov, L. R. Merklin, V. P. Zinkevich, O. V. Levchenko, B. V. Baranov, and G. B. Rudnik *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-008) 16 Aug. 1985 p 15 Transl. into ENGLISH from Geotektonika (Moscow), no. 3, May - Jun. 1985 p 21-37 (For primary document see N86-12697 03-42)
Avail: NTIS HC A04/MF A01

An interpretation of the geological structure of Shirshov Ridge, until recently virtually unstudied, is regarded as highly important due to the position of this ridge at the boundary between two abyssal basins of different age. Only A full comprehension of its tectonic structure will cast light on evolution of the Bering Sea region. A geological and geophysical study of this ridge was made on the 29th cruise of the Dmitriy Mendeleyev in 1982. Dredging was carried out, accompanied by continuous seismic profiling and deep seismic sounding. The ridge extends in a submeridional direction for about 700 km and has a width up to 130 km. In the north it is an underwater extension of the Olyutorsk Peninsula, but with approach to the Aleutian arc it changes its strike to sublatitudinal and at depths of about 3,600 m almost joins the Bowers Ridge. A description of the three principal blocks of the ridge is given. Continuous seismic profiling revealed that the ridge has an asymmetric structure. Deep seismic sounding disclosed that crustal thickness beneath the ridge is as great as 18 km. Three different rock associations were defined: (1) amphibolites, dolerities, quartzy dolerites; (2) deep-water siliceous, siliceous-clayey and tuffogenic-sedimentary deposits of Triassic, late Cretaceous-Paleogene and Oligocene age; and (3) slightly lithified siliceous and terrigenous deposits of Neogene age. The totality of available data suggests that Shirshov Ridge is a zone of crowding of the oceanic crust at the boundary of two differently structured Bering Sea basins. Author

N86-12711# Joint Publications Research Service, Arlington, Va.
FINE STRUCTURE OF DENSITY RELATION IN MAIN OCEANIC THERMOCLINE Abstract Only **c48**
V. M. Zhurbas *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-008) 16 Aug. 1985 p 17 Transl. into ENGLISH from Okeanol. (Moscow), v. 25, no. 2, Mar. - Apr. 1985 p 215-218 (For primary document see N86-12697 03-42)
Avail: NTIS HC A04/MF A01

An important problem in studying fine thermocline structure in the ocean is experimental clarification of the mechanisms of its generation. The best results have been obtained by an analysis of the ratio of the amplitudes of fine-structure temperature and salinity fluctuations. However, in cases (encountered very frequently in the main thermocline) when the thermohaline structure has a steplike character, an analysis of the ratio of the amplitudes of T and S fine-structure fluctuations is inadequate for drawing any conclusions concerning the mechanisms by which the fine structure was formed. It is suggested that in such cases additional information could be obtained by an analysis of the fine structure of the density ratio. The author discusses the degree to which different mechanisms of generation of fine thermohaline structure can exert an influence on variability of the density ratio. It is indicated that in a stepped thermocline structure formed as a result of interaction of intrusion processes and double diffusion (hypothetically, at least, occurring in the main thermocline) there will also be a fine structure of the density ratio. This will afford a possibility for distinguishing such a venture (for example) from the steps produced by local turbulent mixing. The validity of these conclusions was confirmed by probing of a stepped structure in the main thermocline in the tropical Atlantic on the third cruise of the scientific research ship Akademik Mstislav Keldysh. Author

N86-12712# Joint Publications Research Service, Arlington, Va.
VISCOUS NONLINEAR CIRCULATION IN AXISYMMETRIC BAROCLINIC EDDY Abstract Only **c48**
D. O. Gordeyvhev and G. G. Sutyrin *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-008) 16 Aug. 1985 p 18 Transl. into ENGLISH from Okeanol. (Moscow), v. 25, no. 2, Mar. - Apr. 1985 p 186-192 (For primary document see N86-12697 03-42)
Avail: NTIS HC A04/MF A01

A study was made of vertical-radial movements arising in an axisymmetric eddy as a result of the combined influence of nonlinear effects, the most important of which are centrifugal force and the turbulent diffusion of momentum, heat and salt. Specifically, the authors examine the evolution of an axisymmetric disturbance in a rotating layer of stratified fluid in the Boussinesq and quasistatic approximations. It is assumed that the coefficients of turbulent exchange of momentum, heat and salt are equal to one another but are different for the vertical and radial directions. The role of verifical diffusion is evaluated using the value K approx. 0.0001 square meters/sec, characteristic for the main thermocline. The comparative contribution of vertical diffusion is characterized by the dimensionless coefficient K prime = Kr asterisk squared /Az asterisk squared. It is further assumed that radial movements are related to a change in aximuthal velocity. Equations are derived describing the evolution of an eddy in dimensionless variables. In this formulation of the problem a model is developed and examples are presented showing that with identical coefficients of exchange of heat, salt and momentum the joint influence of diffusional processes and nonlinearity results in a radial-vertical circulation of water, for the most part due to centrifugal force. With small values of the Kibel'-Rossby number, a subsidence of water occurs along the axes of eddies in both cyclones and anticyclones, but to a considerably lesser degree in the former than in the latter. Author

N86-12713# Joint Publications Research Service, Arlington, Va.
FACIES-GENETIC GROUPS OF COARSE CLASTIC MATERIAL ON WORLD OCEAN FLOOR Abstract Only **c48**
N. N. Kachanov *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-008) 16 Aug. 1985 p 18-19 Transl. into ENGLISH from Dokl. Akad. Nauk Ukr. SSR, Ser. B: Geol. Khim i Biol. Nauki (Kiev), no. 4, Apr. 1985 p 27-31 (For primary document see N86-12697 03-42)
Avail: NTIS HC A04/MF A01

The author compiled the first map of the geographical distribution of hard rocks on the ocean floor. A description of the position of fragments in situ, the granulometric and morphometric parameters processed on a computer using a special program, lithological and petrochemical data and age determinations are evidence of a multistage character of the processes involved in formation of fields of large clastic material, a diversity of conditions for the mobilization and accumulation of such material in recent and ancient layers of bottom sediments. New data on the development of such deposits at great depths afford possibilities for sounder conclusions in paleogeograhy. The facies and genetic characteristics of such deposits in the Atlantic, Pacific, Indian and Arctic Oceans are described. Important conclusions are drawn concerning the agents responsible for the transport of such materials. In the Atlantic, for example, ice and icebergs played the most important roles, both in the Holocene and earlier. The greatest concentration of psephites is in the high latitudes (north of 25 N and south of 35 to 40 S), where ice and icebergs are and have been most common. However, gravitational processes have also played a role near the Mid-Atlantic Ridge, in shallow-water areas, in tectonically active regions and near strongly abraded rocky shores of continents and islands. A third source is biogenous in nature, such as in reefs and deposits of shells. Similar processes have been operative in all the oceans. The influence of hydrology, bottom geomorphology, climate and geotectonics is also examined. Areas with such deposits of rock materials and bedrock outcroppings usually are a favorite habitat of marine fauna and their study therefrom is of economic significance. Author

N86-12714# Joint Publications Research Service, Arlington, Va.
SPATIAL STRUCTURE OF HIGH-FREQUENCY SEA WIND WAVES UNDER DIFFERENT METEOROLOGICAL CONDITIONS Abstract Only **c48**
I. I. Strizhkin, M. P. Lapchinskaya, Yu. A. Ilin, and V. A. Malinnikov *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-008) 16 Aug. 1985 p 19-20 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atm. i Okeana (Moscow), v. 21, no. 4, Apr. 1985 p 440-442 (For primary document see N86-12697 03-42)
Avail: NTIS HC A04/MF A01

Data are given from a study of the spatial structure of high-frequency wind waves in the range of wavelengths lambda = 1.6 to 60 cm obtained in a photographic survey of the sea surface. The photoinformation on the wavecovered water surface was obtained in stereo- and monosurveys from a platform in the Caspian Sea. The survey was made with two synchronized AFA-41/7.5 aerial cameras from a height of 12 m; survey scale was 1:60; a single photograph covered an areas of 28 square meters on the surface. About 250 photographs of waves obtained under different meteorological conditions and with waves of different classes were processed for an analysis of the spatial distribution of ripples. The total area of water surface analyzed was 150,000 to 200,000 wquare meters. The survey was made in series of 5 to 25 photographs with intervals 2.5, 5 and 10 sec. It was found that with wind velocities from 5 to 18 m/sec the entire surface of the main wave is covered by sectors of capillary and capillary-gravity waves; these sectors have distinct boundaries. Within each sector the waves have a regular structure; in the case of steady waves the capillary and capillary-gravity waves are oriented primarily perpendicularly to the wind velocity, with deviations usually not exceeding 20 deg. There are two principal types of surface spatial distribution of capillary and capillary-gravity waves. In the first on the surface of the sector there are 1-2 identical or somewhat different systems of waves, frequently oriented at an angle to one another. Author

N86-12715# Joint Publications Research Service, Arlington, Va.
NONLINEAR INTERACTION BETWEEN SOLITON AND SHORT WAVES IN IDEAL FLUID Abstract Only **c46**
Ye. S. Benilov *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-008) 16 Aug. 1985 p 20 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atm. i Okeana (Moscow), v. 21, no. 4, Apr. 1985 p 417-421 (For primary document see N86-12697 03-42)
Avail: NTIS HC A04/MF A01

The problem of interaction of waves with considerably different spatial scales is examined. The objective was a determination of the steady form of a restructured soliton (when it is not destroyed by interaction with short waves) for gravity waves in a fluid. During interaction between short surface waves and internal waves resonance can develop, which results in a strong restructuring of both types of waves. The following problem is examined: there are two types of surface gravitational wave movements in an ideal fluid of the finite depth h with a free boundary -- long low-frequency waves ($h/L < < 1$), where L is their characteristic horizontal dimensions, and quasimonochromatic short high-frequency waves ($kh > > 1$), where k is the wave vector of the carrier harmonic. It is assumed that the LF and HF waves propagate in the same direction. The entire analysis is made in a potential, slightly nonlinear approximation. The equations derived and the solutions which are found describe the propagation of a soliton of long gravitational wave on the surface of a fluid against the background of a quashiharmonic short wave. On this basis it was possible to obtain a generalization for a broad spectrum of short waves. A solution describing a solitary internal wave accompanied by a packet of short surfce waves was obtained. Author

N86-12716# Joint Publications Research Service, Arlington, Va.
THE QUESTION OF EARTH EXPANSION AND ITS OCEANIC IMPLICATIONS **c46**
Vladimir Neiman *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-008) 16 Aug. 1985 p 21-23 Repr. from Moscow News (Moscow), no. 13 p 10 (For primary document see N86-12697 03-42)
Avail: NTIS HC A04/MF A01

The hypothesis of Earth expansion was first advanced by Russian scientist I. Yarkovsky nearly a hundred years ago. The idea of Earth expansion was first suggested by Alfred Wegener in the 1920's. According to him, both Americas, Eurasia, Australia and Antarctica formed Panagaea, a single land mass with no oceans between the continents. But the hypothesis of the continents have drifted apart like ships over many thousands of kilometres contradicts physics. However, the continents have still moved apart. So what is the reason for this? The first geologic grounds for this were provided by Hilgenberg. He assumed that the continents do not move along the substratum but drift from one another due to the appearance of new zones between them. This process is going on deep inside the planet and this caused the fragmentation of the single continent and the formation of the seas and oceans in the gaps between the land masses. Author

N86-12717# Joint Publications Research Service, Arlington, Va.
KAMCHATKA RADIO TELEMETRIC STATION REGISTERS VOLCANO PULSE Abstract Only **c46**
In its USSR Rept.: Earth Sci. (JPRS-UES-85-008) 16 Aug. 1985 p 24 Repr. from TASS (Moscow), v. 5-15 20 May 1985 (For primary document see N86-12697 03-42)
Avail: NTIS HC A04/MF A01

Information which serves as the basis for forecast of volcano eruptions is supplied to scientists in the Kamchatka (the Soviet Far East). A radio telemetric station installed on the slopes of Klychevskaya Sopka volcano, one of the biggest in Euroasia, is constantly registering the pulse of the volcano and automatically supplies the information to the receiving station. This method has already helped to predict the eruption of a number of volcanoes with high accuracy. Soviet seismologists are creating a system of prompt collection of geophysical information from areas of seismic activity in thhe peninsula. A series of telemetric stations has been designed for the purpose at the Institute of Volcanology of the Far Eastern Scientific Center of the USSR Academy of Sciences. Author

N86-12718# Joint Publications Research Service, Arlington, Va.
LASERS MEASURE DRIFTING MOUNTAINS Abstract Only **c46**
In its USSR Rept.: Earth Sci. (JPRS-UES-85-008) 16 Aug. 1985 p 25 Transl. into ENGLISH from TASS (Moscow), no. 0447 GMT, 12 Apr. 1985 (For primary document see N86-12697 03-42)
Avail: NTIS HC A04/MF A01

Soviet Tajik scientists have established with the use of lasers that two mountain ranges in Pamir have moved closer to each other by half a meter in three decades. By taking regular measurements with a light beam of the distance between the Karategin and Petr Pervyy ranges, they noticed a previously undiscovered phenomenon. It transpires that the two giant ranges sometimes move closer, and sometimes, further apart. Scientists believe that the drifting is connected with tectonics processes deep in the Earth and is not disastrous. It is yet another natural phenomenon which was previously unknown. Author

N86-12719# Joint Publications Research Service, Arlington, Va.
LAUNCH OF KOSMOS-1653 NATURAL RESOURCES RESEARCH SATELLITE Abstract Only **c18**
In its USSR Rept.: Earth Sci. (JPRS-UES-85-008) 16 Aug. 1985 p 27 Transl. into ENGLISH from Sots. Ind. (Moscow), 24 May 1985 p 2 (For primary document see N86-12697 03-42)
Avail: NTIS HC A04/MF A01

An artificial Earth satellite, Kosmos-1653, was launched from the Soviet Union on May 22, 1985. Installed on board the satellite is scientific apparatus intended for the continuation of research of the Earth's natural resources in the interests of various branches of the USSR's economy and of international cooperation. The satellite was placed into an orbit with the parameters: initial period of revolution--89.6 minutes; apogee--322 kilometers; perigee-222 kilometers; orbit inclination--82.3 degrees. Incoming information is being transmitted to the State scientific Research and Production Center Priroda for processing and utilization. Author

N86-12720# Joint Publications Research Service, Arlington, Va.
MUON TOMOGRAPHY USED TO STUDY UNDERGROUND ROCK STRUCTURE Abstract Only **c46**
A. Alekseyev *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-008) 16 Aug. 1985 p 28 Transl. into ENGLISH from NTR: Probl. i Resheniya (Moscow), 30 Apr. - 13 May 1985 p 6 (For primary document see N86-12697 03-42)
Avail: NTIS HC A04/MF A01

A method called muon tomography has been developed to study underground rock structure. The flow of cosmic rays, penetrating the Earth's atmosphere produces a downpour of various elementary particles, including muons. They are capable of penetrating for kilometers into the Earth's depths. These particles can be used as a source for x-raying underground rock and also foundations of engineering structures. Instruments used for such measurements have been given the name of muon telescopes. Usually they are installed in a tunnel beneath the object to be studied, and the object's density is measured with high accuracy according to the intensity of radiation falling on detectors. Muons help to detect hollow spaces in underground rock masses which form as a result of the washing out of soluble rock by ground water, such as in limestone. The recording principle is the same: if such hollow spaces are present in the zone of visibility of a muon telescope, the flow of recorded particles increases immediately. B.W.

N86-12721# Joint Publications Research Service, Arlington, Va.
UNDERGROUND VOLCANOES DISCOVERED WITH SATELLITE RADAR Abstract Only **c46**
In its USSR Rept.: Earth Sci. (JPRS-UES-85-008) 16 Aug. 1985 p 29 Transl. into ENGLISH from Sov. Belorussiya (Minsk), 23 May 1985 p 4 (For primary document see N86-12697 03-42)
Avail: NTIS HC A04/MF A01

The crates of two giant volcanoes have been discovered with the help of satellite radar. One of them is located beneath the scorching sands of the West Sahara, while the other is warming the ice of Antarctica. A radar system developed by Khar'kov scientists in collaboration with specialists of Moscow and Sevastopol made it possible to see the craters. This system is installed on board the Soviet satellites Cosmos-1500 and Cosmos-1602. Author

N86-12722# Joint Publications Research Service, Arlington, Va.
P-WAVE SPECTRA IN PROBLEM OF DETERMINING DYNAMIC

PARAMTERS OF EARTHQUAKE FOCI. STANDARDIZATION OF INITIAL DATA AND PROCEDURES FOR COMPUTING AMPLITUDE SPECTRA Abstract Only **c46**

Zh. Ya. Aptekman, S. K. Daragan, D. V. Dolgopolov, A. I. Zakharova, V. M. Zobin, S. Ya. Kogan, O. A. Korchagina, A. G. Moskvina, L. A. Polikarpova, and L. S. Chepkunas *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-008) 16 Aug. 1985 p 30 Transl. into ENGLISH from Vulkanol. i Seysmologiya (Moscow), no. 2, Mar. - Apr. 1985 p 60-70 (For primary document see N86-12697 03-42)
Avail: NTIS HC A04/MF A01

The focal parameters of earthquakes are commonly determined from the spectra of P-waves, but comparison of the results obtained by different authors for the same event on the basis of different materials often reveals serious discrepancies, as great as an order of magnitude. The authors believe that this situation is not due to any fundamental deficiency of the spectral method, but instead is attributable to the use of different hypotheses and formulas relating the spectral parameters and focal parameters of earthquake foci and the result of lack of a consistent, fully validated approach in the choice of initial material. The thrust of the article is therefore the need for standardizing requirements on the initial material, processing procedures and computation methods. The authors examine each aspect of this problem: choice of initial material; instrumentation used; seismogram quality; signal level; signal-to-noise ratio; choice of length of analyzed segment of record; zero line; beginning and end of interval on record reduced to digital form; digital interval; choice of algorithm for computing spectra; numerical range of spectrum; frequency interval; instrumental correction; averaging of spectra. Author

N86-12723# Joint Publications Research Service, Arlington, Va.
PROSPECTS FOR DEVELOPMENT OF SEISMIC PROSPECTING METHODS AND APPARATUS Abstract Only **c46**

Yu. V. Timoshin *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-008) 16 Aug. 1985 p 31 Transl. into ENGLISH from Geofiz. Zh. (Kiev), v. 7, no. 2, Mar. - Apr. 1985 p 3-12 (For primary document see N86-12697 03-42)
Avail: NTIS HC A04/MF A01

Mobile stations (MS) for exciting oscillations and self-contained reception and registry stations (SRRS) are discussed. These ensure excitation of seismic oscillations on the land and in the water by a contactless method, that is, in the total absence of a mechanical coupling between the source and the ground. A number of stages can be defined in the development of such a seismic prospecting system. The first stage involves development of self-contained apparatus for the reception and registry of seismic oscillations mounted on a truck or other vehicle with excellent cross-country capabilities, this being the most important element in the complete mechanization of the entire observation process. The second stage involves development of sources of contactless excitation of oscillations. The third stage involves improvement of means for the reception of oscillations by use of aerial pressure detectors and antennas for the reception of the electromagnetic waves accompanying the propagation of seismic waves in geological media. The fourth stage involves the development of methods and apparatus for the remote contactless reception of seismic oscillations. B.W.

N86-12724# Joint Publications Research Service, Arlington, Va.
DETERMINATION OF DYNAMIC PARAMETERS OF REFLECTED WAVES ON SLOPES OF DEEP WATER TRENCH Abstract Only **c48**

V. G. Bykov, F. A. Vorobyev, V. V. Zhigulev, and S. S. Snegovskoy *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-008) 16 Aug. 1985 p 32 Transl. into ENGLISH from Tikhookeanskaya Geol. (Novosibirsk), no. 1, Jan. - Feb. 1985 p 99-103 (For primary document see N86-12697 03-42)
Avail: NTIS HC A04/MF A01

An attempt is made to determine the absorption and reflection coefficients in the sedimentary mass of three different sections in the north-west Pacific in parallel with continuous seismic profiling. The area of studies is a part of the Kuril-Kamchatka deep water trench. The first section is more than 100 km from the axis of the trench in an area with a water depth of about 1200 m. The second is located at the base of the ocean slope of the island structure some 150 km from the trench axis, bottom depth about 1100 m. Section three is on the oceanic slope of the trench, some 20 km from its main portion. In all three areas there are two layers of sedimentary deposits differeing both in internal structure and in physical properties. The observed similarities in structure, lithologic composition and physical properties of the sedimentary deposits of the oceanic and deep water portions of the continental slope along the Kuril-Kamchatka trench indicate simiarity of the sedimentation process in these zones as well. Author

N86-12725# Joint Publications Research Service, Arlington, Va.
OPTIMAL DENSITY MODEL OF EARTH'S RUST AND UPPER MANTLE ALONG KAMCHATKA-PACIFIC GEOTRAVERSE Abstract Only **c46**

M. L. Krasnyy, V. Yu. Kosygin, and V. I. Isayev *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-008) 16 Aug. 1985 p 32-33 Transl. into ENGLISH from Tikhookeanskaya Geol. (Novosibirsk), no. 1, Jan. - Feb. 1985 p 72-84 (For primary document see N86-12697 03-42)
Avail: NTIS HC A04/MF A01

An a priori density model was constructed of a geotraverse from Kamchatka to the Pacific Ocean on the basis of a seismic model and the known relationship between velocity and density, extending over 400 km on the surface and down to a depth of 250 km. Multidimensional modeling was used to solve the inverse problem producing reliable solutions for 80% of the approximating blocks greatly reducing the inaccuracies of the a priori model. It was found that at great depths the lithospheric plate apparently dissolves (is assimilated into the mantle). The lithospheric layer beneath the continental block and the boundary of the ocean section has a thickness of 50 to 60 and 80 km, the mean density of the lithosphere in the continental block being significantly less than that of the oceanic block. Density is reduced beneath the seismofocal zone in both west and east, while the seismofocal zone itself is denser than the asthenosphere and the underlying subasthenosphere layer. Author

N86-12726# Joint Publications Research Service, Arlington, Va.
VARIATION IN SEISMICITY UNDER INFLUENCE OF LUNAR-SOLAR TIDAL DEFORMATIONS Abstract Only **c46**

A. L. Rykunov and V. B. Smirnov *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-008) 16 Aug. 1985 p 33 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Zemli (Moscow), no. 1, Jan. 1985 p 97-103 (For primary document see N86-12697 03-42)
Avail: NTIS HC A04/MF A01

Studies of the relationship of variations of seismicity to external effects in the past have been based primarily on data from a regional network of seismic stations, resulting in the use of only large, infrequent events. This makes it impossible to use correlation and spectral analysis methods as can be done with higher frequency seismic noise, hindering comparison of the specifics of the response of the medium on various scales. These shortcomings can be avoided by analyzing the time distribution of microearthquakes, which are repeated much more frequently. Observations with highly sensitive and independent recording apparatus were performed in an area of high seismic activity in 1981 on Kamchatka. Microearthquakes were continuously recorded for 24 hours. Analysis of the distribution of these minor earthquakes indicated that there is a correlation between seismicity and tidal effects. The presence of a system of quasiperiodic variations in seismicity was noted. The distribution of microearthquakes caried over time from statistically independent tests. The existence of microearthquakes swarms related to seismicity maxima was noted. Author

N86-12727# Joint Publications Research Service, Arlington, Va.
ELECTROMAGNETIC EFFECTS IN CRUSTAL FRACTURING Abstract Only **c46**

M. B. Gokhberg, I. L. Gufeld, N. I. Gershenzon, and V. A. Pilipenko *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-008) 16 Aug. 1985 p 34 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz.

Zemli (Moscow), no. 1, Jan. 1985 p 72-87 (For primary document see N86-12697 03-42)
Avail: NTIS HC A04/MF A01

The major results from field observation of electromagnetic precursors of seismic events are presented. These phenomena, including disturbances in the atmospheric electric potential, pulsed electromagnetic radiation, electrotelluric fields and luminous effects, characteristically appear on the order of the hours to days before earthquakes, with earthquakes occurring during a decreasa in the phenomena. The phenomena occur over a broad frequency range. All anomalies except for electromagnetic radiation have been observed at the epicenters of earthquakes. Foreshocks have not been recorded during these anomalies. No burst of electromagnetic, atmospheric electric or electrotelluric fields has been observed at the moment of earthquakes. Electromagnetic radiation in the radio frequency band is considered most promising for earthquake prediction purposes. The specific characteristics of electromagnetic radiation caused by seismic phenomena must be determined in order to distinguish this radiation from other electromagnetic radiation. Author

N86-12728# Joint Publications Research Service, Arlington, Va.
EXPERIENCE IN BREAKING DOWN GRAVITY FIELD INTO COMPONENTS RESULTING FROM DENSITY HETEROGENEITIES AT VARIOUS DEPTHS (USING NORTH ATLANTIC AND MEDITERRANEAN AS EXAMPLES) Abstract Only c46
M. Ye. Artemyev, T. M. Babayeva, I. Ye. Voydetskiy, and V. O. Mikhaylov *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-008) 16 Aug. 1985 p 34-35 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Zemli (Moscow), no. 1, Jan. 1985 p 44-52 (For primary document see N86-12697 03-42)
Avail: NTIS HC A04/MF A01

A spectral analysis of gravity anomalies is presented. The intitial data for the analysis were values of isostatic anomalies in the North Atlantic, Western Europe and the Mediterranean, averaged in 1 x 1 degree trapezoids based on published foreign data on the gravity field. The field was divided into components using a minimum-square Kolmogorov-Wiener filter using an algorithm which considered the spherical nature of the earth and was suitable for processing files of up to 10,000 points on a BESM-6 computer. The results indicate that the study of heterogeneities located deeper than the level of isostatic compensation requires the use of gravity anomalies after introduction of corrections for the major surface density heterogeneities and their isostatic compensation. Subasthenospheric density heterogeneities create gravitational anomalies with wavelengths of 800-1000 km. There are two classes of deep density heterogeneities which appear in the gravity field at wavelengths of between 1000 and 2000 km and greater than 2000 km. Author

N86-12729# Joint Publications Research Service, Arlington, Va.
HYPOCENTRAL AREAS OF AFTERSHOCKS AND POSSIBLE FAULT SYSTEMS AT FOCI OF TSUNAMI-GENERATING KURIL EARTHQUAKES Abstract Only c46
S. L. Solovyev and K. A. Kechekezyan *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-008) 16 Aug. 1985 p 35 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Zemli (Moscow), no. 1, Jan. 1985 p 3-15 (For primary document see N86-12697 03-42)
Avail: NTIS HC A04/MF A01

While acknowleding the limited capabilities and low reliability of the aftershock method of analyzing processes at the foci of earthquakes, particalarly in the Kuril-Kamchatka area, it was still decided to use this method as the only possible one to study the foci of five comparatively recent tsunami-generating Kuril earthquakes. The results of the analysis were compared with available information on the tectonics of the island slope of the Kuril deep water trench. Data on the foci of the tsunamis and intensity of the waves were the result of standard determination of the focal mechanism. The five earthquakes all had a magnetude greater than 7 and occurred between 1969 and 1975. The results indicate that the model of a single fault presently used to describe processes of foci of tsunami-generating and strong Kuril-Kamchatka earthquakes in general is not sufficient and is too arbitrary. More effective methods of reconstructing these processes must be developed, since they may well consist of movements along several faults simultaneously. Author

N86-12730# Joint Publications Research Service, Arlington, Va.
METHOD AND RESULTS OF ELECTROMETRIC OBSERVATIONS IN SEISMICALLY ACTIVE REGION Abstract Only c46
M. G. Ostashevskiy and A. Ya. Sidorin *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-008) 16 Aug. 1985 p 36 Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 282, no. 2, May 1985 p 295-299 (For primary document see N86-12697 03-42)
Avail: NTIS HC A04/MF A01

Any increases in the accuracy of measurement of rock impedance will afford new possibilities for diagnosis of its state and use of the electrometric method in research on earthquake prediction. The article describes the fundamental principles and methods for contending with noise in electrical sounding which make possible a considerable increase in the inefficiency of accumulations and gives some results of observations of variations of impedance in the Garm geophysical test range in the seismically active part of the Tajik SSR. An optimum accumulation algorithm was developed on the basis of the statistical properties of a large number of records of noise observed during electrical sounding. The great volume of research data ensured full automation of the experiment by direct input of data from a precise digital measuring instrument into a minicomputer where they were processed using different algorithms at a real time scale. Measurements are made once a day in half-hour intervals. The pulse repetition rate was 24 sec and the duration of one accumulation cycle was 132 sec. B.W.

N86-12731# Joint Publications Research Service, Arlington, Va.
SEISMIC EFFECT OF UNDERGROUND BLASTS AND PROBLEM OF ESTIMATING TOTAL EARTHQUAKE ENERGY Abstract Only c46
M. A. Sadovskiy, O. K. Kedrov, V. A. Laushkin, and I. L. Pasechnik *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-008) 16 Aug. 1985 p 37 Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 281, no. 4, Apr. 1985 p 825-829 (For primary document see N86-12697 03-42)
Avail: NTIS HC A04/MF A01

An estimate is presented of the upper limit of total earthquake energy based on seismic energy determined by remote seismic measurement of P waves using records of American underground nuclear blasts with known source energy. The work is a contribution to the formulation of an absolute energy scale for earthquakes based on records of P waves from 99 underground blasts in the continental USA and on Amchitka Island. Records were obtained at two experimental stations in the USSR located at distances of 60 and 90 degrees from the epicenters of the blasts. The events were recorded in a three-component short-period channel with a gain of 2 x 10 to the 5th power at 1 Hz. It is found necessary to consider signal frequency in determining the absorption coefficient. The most objective energy estimates can be obtained if integration includes only the focal P wave, suppressing P-coda oscillations by frequency and polarization filtration. Calculations should be performed in the frequency range rather than in the time range, though comparable results are produced by the two methods in the first approximation. B.W.

N86-12732# Joint Publications Research Service, Arlington, Va.
TECTONICS OF EASTERN KRONOTSKIY PENINSULA AND FORMATIONAL ASSOCIATION OF BASALTS (KAMCHATKA) Abstract Only c46
Yu. N. Raznitsin, S. A. Khubunaya, and N. V. Tsukanov *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-008) 16 Aug. 1985 p 37-38 Transl. into ENGLISH from Geotektonika (Moscow), no. 1, Jan. - Feb. 1985 p 88-101 (For primary document see N86-12697 03-42)
Avail: NTIS HC A04/MF A01

Results are presented from combined tectonic and geochemical studies of Cretaceous and Paleogene effusive-pyroclastic and

tuffogenous-silicaceous formations in the eastern Kronotskiy Peninsula. The region of studies is a part of the eastern Kamchatka Peninsula in the immediate vicinity of the island slope of the Kuril-Kamchatka deep water trench. The studies allow a new interpretation of the structure of this region and the relationship of ultrabasic rocks to their surroundings. The studies establish a cover-flake structure for the Late Cretaceous formations proving them to be of Senonian age. For the first time, a serpentinite melange is described in eastern Kamchatka, present at the base of overthrust planes and also making up several independent plates and small protrusions. It is concluded that there was Late Cretaceous obduction on the ocean side, the melange and ultrabasites belonging to the base of the eugeosynclinal area. The Upper Cretaceous and Paleogenic formations belong to the island arcs in their early stages of development. A new transition zone from the ocean to the continent, a sharply arched volcanic-plutonic high-alumina plagiotholeiitic province is distinguished on the basis of petrochemical and geochemical data. Author

N86-12733# Joint Publications Research Service, Arlington, Va.
GEODYNAMICS OF CRUSTAL DILATATION IN TRANSITION AREA FROM ASIAN CONTINENT TO PACIFIC OCEAN Abstract Only c46
V. P. Utkin *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-008) 16 Aug. 1985 p 38 Transl. into NGLISH from Geotektonika (Moscow), no. 1, Jan. - Feb. 1985 p 73-87 (For primary document see N86-12697 03-42)
Avail: NTIS HC A04/MF A01

A study is presented of the kinematics of deep fractures in the Asian-Pacific transition zone in order to establish the regularities of motion of the Asian and Pacific geoblocks in time and space. Crustal dilatation is shown to result from shear activation of deep faults. The major kinematic systems of deep faults are diagrammed. A close genetic relationship is demonstrated between volcanism, intrusive magmatism and orogenesis and the shear activation of deep faults. The specifics of spatial interrelationship of the various folded dislocation elements correspond to the organization of structures with lateral displacement of the Asian continent toward the southwest and movement of the Pacific and Kula plates toward the northeast. The volcanogenic belt is controlled by straight deep faults, and only superficial analysis by other investigators has allowed many of them to consider parts of the belt to be arc shaped. Establishment of the specifics of the evolutionary development of shear dislocations is very important for a solution of the problem of space and time relationships among various forms of plicative and destructive structures in the zone. Author

N86-12734# Joint Publications Research Service, Arlington, Va.
TRANSMISSION OF TROPOSPHERIC RADIATION OF LASERS ON MOLECULES OF DIFFERENT CARBON DIOXIDE ISOTOPES Abstract Only c36
V. N. Arefyev *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-008) 16 Aug. 1985 p 41 Transl. into ENGLISH from Kvantovaya Elektron. (Moscow), v. 12, no. 3, Mar. 1985 p 631-634 (For primary document see N86-12697 03-42)
Avail: NTIS HC A04/MF A01

CO2 lasers operating in different lines of the bands 00 sup 0 1-10 sup 0 0 and 00 sup 0 1-02 sup 0 0 of molecules of different carbon dioxide isotopes are coming into increasing use for remote measurements of the parameters of the gas composition of the atmosphere. Their generation spectrum coincides with the window of relative atmospheric transparency 8-13 micro m. However, the solution of many problems requires a reliable knowledge of the parameters of molecular absorption of the emission of CO2 lasers in the troposphere. The theoretical possibility of generation of laser radiation in 960 lines of seven CO2 isotopes has been demonstrated. In order to fill this gap partially the authors give the results of computations of the transmission of laser radiation on seven isotopes of carbon dioxide by the tropospheric layer during summer in the middle latitudes of the northern hemisphere. The most transparent microwindow has a transmission of 80-85% in the region 10 micro m, where losses for the most part are determined by the continuous absorption of water vapor. The computations make it possible to analyze the contribution of each gas to the total attenuation of the radiation of CO2 lasers by the atmosphere due to molecular absorption. B.W.

N86-12735# Joint Publications Research Service, Arlington, Va.
ATMOSPHERIC TURBULENCE INVESTIGATIONS AT TSMILYANSK SCIENTIFIC STATION, ATMOSPHERIC PHYSICS INSTITUTE, USSR ACADEMY OF SCIENCES Abstract Only c46
L. R. Tsvang *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-008) 16 Aug. 1985 p 42-43 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atm. i Okeana (Moscow), v. 21, no. 4, Apr. 1985 p 339--348 (For primary document see N86-12697 03-42)
Avail: NTIS HC A04/MF A01

The Tsimlyansk Scientific Station of the Atmospheric Physics Institute was established in 1957. It is situated in a level, uncultivated steppe sector surrounded by cultivated lands. Measurements are made in a level, uniform area of virgin steppe measuring 700 x 650 m. There is an underground facility from which remote measurements can be made. There is a 40-m mast which carries 6 sets of sensors for measuring the vertical profiles of wind velocity and temperature in the range of heights from 1 to 32 m and a mobile carrier with a set of sensors (acoustic anemometer, resistance thermometer) for measuring fluctuations of the three components of wind velocity and temperature in this same range of heights. The most important work done during the last 25 years is reviewed and the most important work to be done in the future is outlined. Such work will include study of processes of interaction between the atmosphere and the underlying surface under nonstationary conditions, especially in the presence of variable cloud cover, with allowance for the influence of radiational nonuniformity of the underlying surface, for developing a model of turbulent processes transpiring under the conditions most frequently observed in nature. B.W.

N86-12736# Joint Publications Research Service, Arlington, Va.
HUMIDITY PROFILE MESUREMENTS IN ATMOSPHERIC LOWER LAYER BY SPONTANEOUS RAMAN SCATTERING METHOD Abstract Only c47
O. A. Bukin, S. Yu. Stolyarchuk, and V. A. Tyapkin *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-008) 16 Aug. 1985 p 43-44 Transl. into ENGLISH from Zh. Prikl. Spektroskopii (Minsk), v. 42, no. 4, Apr. 1985 p 631-636 Original language document was announced in IAA as A85-38572 (For primary document see N86-12697 03-42)
Avail: NTIS HC A04/MF A01

Vertical distributions of water vapor in the lower atmospheric layer (up to 500 m) above the sea surface were obtained using a Raman lidar operating at the frequency of the second harmonic of a YAG:Nd laser. The measurements of one profile took 15 minutes; the altitude resolution was 84 m, with a humidity measurement error of less than approximately 14 percent at the end of the path. It is suggested that the use of a processing system for signals from photomultipliers, which makes it possible to count simultaneously photoelectrons from all parts of the path, will improve spatial resolution and reduce the duration of humidity measurements. Finally, a method for lidar calibration is described. L.T. (IAA)

N86-12737# Joint Publications Research Service, Arlington, Va.
SOME CHARACTERISTICS OF TRANSMISSION BY THIN CLOUDS IN VISIBLE AND INFRARED SPECTRAL REGIONS Abstract Only c47
Yu. S. Georgiyevskiy and A. Kh. Shukurov *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-008) 16 Aug. 1985 p 44-45 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atm. i Okeana (Moscow), v. 21, no. 4, Apr. 1985 p 397-402 (For primary document see N86-12697 03-42)
Avail: NTIS HC A04/MF A01

The article gives the results of investigations of attenuation of radiation by thin cirrus (not less than 100 spectra) and cumulus clouds or their margins (more than 100 spectra) under spring, summer and autumn conditions in a moderately moist climatic

zone in five parts of the visible and IR spectral regions. Since the principal difficulty in measuring transmission through clouds is their temporal and spatial variability, the method was proposed for measuring transmission through clouds simultaneously at several wavelengths. A solar radiation flux was directed into the laboratory room by an ATsU-24 coelostat situated in a tower at a height of 15 m. It was found that cirrus clouds are more transparent (over 80% of the cases) in the visible range, whereas cumulus clouds are more transparent in the IR range (100% of the cases). This information can be used in the reliable discrimination of ice and liquid droplet clouds on the basis of data from remote measurements. B.W.

43 EARTH RESOURCES

Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography.

For instrumentation see *35 Instrumentation and Photography.*

N86-12738* National Aeronautics and Space Administration, Washington, D. C.
EARTH RESOURCES: A CONTINUING BIBLIOGRAPHY, ISSUE 46
Jul. 1985 140 p
(NASA-SP-7041(46); NAS 1.21:7041(46)) Avail: NTIS HC $12.00 CSCL 05B

This bibliography lists 467 reports, articles and other documents introdcued into the NASA scientific and technical information system between April 1 and June 30, 1985. Emphasis is placed on the use of remote sensing and geophysical instrumentation in spacecraft and aircraft to survey and inventory natural resources and urban areas. Subject matter is grouped according to agriculture and forestry, environmental cultural resources geodesy and cartography, geology and mineral resources, hydrology and water management, data processing and distribution systems, instrumentation and sensors, and economical analysis. F.M.R.

N86-12739*# Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
FEASIBILITY OF USING LANDSAT IMAGES OF VEGETATION COVER TO ESTIMATE EFFECTIVE HYDRAULIC PROPERTIES OF SOILS Semiannual Technical Report, 1 Feb. - 31 Jul. 1985
Peter S. Eagleson 31 Jul. 1985 20 p refs ERTS
(Grant NAG5-510)
(E86-10003; NASA-CR-176266; NAS 1.26:176266) Avail: NTIS HC A02/MF A01 CSCL 08H

Research activities conducted from February 1, 1985 to July 31, 1985 and preliminary conclusions regarding research objectives are summarized. The objective is to determine the feasibility of using LANDSAT data to estimate effective hydraulic properties of soils. The general approach is to apply the climatic-climax hypothesis (Ealgeson, 1982) to natural water-limited vegetation systems using canopy cover estimated from LANDSAT data. Natural water-limited systems typically consist of inhomogeneous vegetation canopies interspersed with bare soils. The ground resolution associated with one pixel from LANDSAT MSS (or TM) data is generally greater than the scale of the plant canopy or canopy clusters. Thus a method for resolving percent canopy cover at a subpixel level must be established before the Eagleson hypothesis can be tested. Two formulations are proposed which extend existing methods of analyzing mixed pixels to naturally vegetated landscapes. The first method involves use of the normalized vegetation index. The second approach is a physical model based on radiative transfer principles. Both methods are to be analyzed for their feasibility on selected sites. F.M.R.

N86-12740*# Kansas Univ. Center for Research, Inc., Lawrence. Remote Sensing Lab.
EVALUATION OF SPACE SAR AS A LAND-COVER CLASSIFICATION Final Report
B. Brisco, F. T. Ulaby, and T. H. Lee Williams [1985] 123 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS
(Contract NCC9-7)
(E86-10004; NASA-CR-176267; NAS 1.26:176267; RSL-TR-605-1) Avail: NTIS HC A06/MF A01 CSCL 02B

The multidimensional approach to the mapping of land cover, crops, and forests is reported. Dimensionality is achieved by using data from sensors such as LANDSAT to augment Seasat and Shuttle Image Radar (SIR) data, using different image features such as tone and texture, and acquiring multidate data. Seasat, Shuttle Imaging Radar (SIR-A), and LANDSAT data are used both individually and in combination to map land cover in Oklahoma. The results indicates that radar is the best single sensor (72% accuracy) and produces the best sensor combination (97.5% accuracy) for discriminating among five land cover categories. Multidate Seasat data and a single data of LANDSAT coverage are then used in a crop classification study of western Kansas. The highest accuracy for a single channel is achieved using a Seasat scene, which produces a classification accuracy of 67%. Classification accuracy increases to approximately 75% when either a multidate Seasat combination or LANDSAT data in a multisensor combination is used. The tonal and textural elements of SIR-A data are then used both alone and in combination to classify forests into five categories. Author

N86-12741*# Purdue Univ., West Lafayette, Ind. Lab. for Applications of Remote Sensing.
SOYBEAN CANOPY REFLECTANCE MODELING DATA SETS
K. J. Ranson, L. L. Biehl, and C. S. T. Daughtry Jul. 1984 55 p refs ERTS
(Contract NAS9-16528)
(E86-10005; NASA-CR-171895; NAS 1.26:171895; LARS-TR-071584) Avail: NTIS HC A04/MF A01 CSCL 05B

Numerous mathematical models of the interaction of radiation with vegetation canopies have been developed over the last two decades. However, data with which to exercise and validate these models are scarce. During three days in the summer of 1980, experiments are conducted with the objective of gaining insight about the effects of solar illumination and view angles on soybean canopy reflectance. In concert with these experiment, extensive measurements of the soybean canopies are obtained. This document is a compilation of the bidirectional reflectance factors, agronomic, characteristics, canopy geometry, and leaf, stem, and pod optical properties of the soybean canopies. These data sets should be suitable for use with most vegetation canopy reflectance models. Author

N86-12742*# Pacific Northwest Lab., Richland, Wash.
LANDSAT-4 TM IMAGE DATA QUALITY ANALYSIS FOR ENERGY-RELATED APPLICATIONS Executive Summary
G. E. Wukelic and H. P. Foote 1983 4 p refs Presented at the 3rd LANDSAT-4 Investigators' Workshop, Richland, Wash., 6-7 Dec. 1983 Sponsored by NASA ERTS
(E86-10006; NASA-CR-171074; NAS 1.26:171074; PNL-SA-11861) Avail: NTIS HC A02/MF A01 CSCL 05B

LANDSAT-4 Thematic Mapper (TM) data performance and utility characteristics from an energy research and technology perspective is evaluated. The program focuses on evaluating applicational implications of using such data, in combination with other digital data, for current and future energy research and technology activities. Prime interest is in using TM data for siting, developing and operating federal energy facilities. Secondary interests involve the use of such data for resource exploration, environmental monitoring and basic scientific initiatives such as in support of the Continental Scientific Drilling Program. Author

N86-12743*# Virginia Polytechnic Inst. and State Univ., Blacksburg.
TRANSIENT THERMAL MODELING OF THE NONSCANNING ERBE DETECTOR Final Report, 13 Nov. 1980 - 30 Sep. 1982

J. R. Mahan Nov. 1983 107 p
(Contract NAS1-16508)
(NASA-CR-172240; NAS 1.26:172240) Avail: NTIS HC A06/MF A01 CSCL 14B

A numerical model to predict the transient thermal response of the ERBE nonscanning wide field of view total radiometer channel was developed. The model, which uses Monte Carlo techniques to characterize the radiative component of heat transfer, is described and a listing of the computer program is provided. Application of the model to simulate the actual blackbody calibration procedure is discussed. The use of the model to establish a real time flight data interpretation strategy is recommended. Modification of the model to include a simulated Earth radiation source field and a filter dome is indicated. E.A.K.

N86-12744# Naval Ocean Research and Development Activity, Bay St. Louis, Miss.
DATA ANALYSIS OF AIRBORNE ELECTROMAGNETIC BATHYMETRY Final Report
R. Zollinger, A. Becker, and F. Morrison Apr. 1985 21 p
(AD-A157132; NORDA-93) Avail: NTIS HC A02/MF A01 CSCL 08/10

This report describes an experimental evaluation of the concept of airborne electromagnetic bathymetry. The airborne electromagnetic data that forms the basis of this project was acquired with the Mark VI INPUT system along a 17-mile-long flight path off Cape Breton Island in the province of Nova Scotia. The water depth beneath the flight path ranged from 0 to more than 40 m. Author (GRA)

N86-12745# Institut fuer Digitale Bildverarbeitung und Graphik, Graz (Austria).
CORRECTING A DIGITAL MAP DATA BASE WITH SCENE ANALYSIS CONCEPTS AND METHODS Interim Technical Report, 1 Jan. 1983 - 31 Dec. 1984
H. Ranzinger May 1985 94 p
(Contract DAJA45-83-C-0022)
(AD-A157913; R/D-4161-R-EN) Avail: NTIS HC A05/MF A01 CSCL 08/2

The problem of updating maps has always been of considerable interest for cartographers.. With the advent of digital cartography and the supply of aerial imagery in digital form in the near future, the question arises in which way information to update maps may automatically be derived from digital imagery by means of scene analysis. This paper proposes an approach and show how a solid set of methods, modularly designed and based on an image processing language, may serve as a toolkit for experimentation. Examples are given by applying the methods to a multitemporal sequence of digitized metric aerial photos. GRA

N86-12746# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
STRATEGIES FOR ASSOCIATING DATA AND LOCATION IN A GEOGRAPHIC INFORMATION SYSTEM M.S. Thesis
R. G. Waiton 1985 120 p
(AD-A158118; AFIT/CI/NR-85-78T) Avail: NTIS HC A06/MF A01 CSCL 08/2

Much of the existing work in the area of Geographic Information Systems (GIS) treats spatial objects, e.g., points, lines, and regions, as the primary entities of interest. In that approach, descriptive information is associated directly with each of these data items. This paper explores the feasibility of implementing an alternative design which uses Location Data Sets and Location Predicates as the basic entities managed by a Location Data Management System (LDMS). A major advantage of the proposed approach is its suitability for automatic enforcement of data consistency across multi-scale geographic entities. The central idea of the Location Data Set approach is that spatial data should be directly associated with locations rather than named regions or points. The relationships between geographic entities and data values may then be derived through the intermediate relationship of shared location. It is envisioned that each type of data which is distributive in nature would be stored in a separate set. Data values associated with conventional points, lines, and regions would then be merely restrictions on these global data sets. This is similar to the way in which the external views of a database represent a subsetting of the global data. The paper includes a survey of 15 selected GIS implementations and existing work relevant to identified implementation obstacles. Author (GRA)

N86-12747# Idaho Dept. of Water Resources, Boise.
WATER INFORMATION BULLETIN NO. 30, PART 13: GEOTHERMAL INVESTIGATIONS IN IDAHO. PRELIMINARY GEOLOGIC RECONNAISSANCE OF THE GEOTHERMAL OCCURRENCES OF THE WOOD RIVER DRAINAGE AREA
J. E. Anderson, K. Bideganeta, and J. C. Mitchell Apr. 1985 54 p refs
(Contract DE-AS07-77ET-28407)
(DE85-016972; DOE/ET-28407/T6) Avail: NTIS HC A04/MF A01

Pre-tertiary sediments of the Milligen and Wood River Formations consisting primarily of argillite, quartzite, shale and dolomite are, for the most part, exposed throughout the area and are cut locally by outliers of the Idaho Batholith. At some locations, Tertiary-age Challis Volcanics overlay these formations. Structurally the area is complex with major folding and faulting visible in many exposures. Many of the stream drainages appear to be fault controlled. Hydrologic studies indicate hot spring occurrences are related to major structural trends, as rock permeabilities are generally low. Geochemical studies using stable isotopes of hydrogen and oxygen indicate the thermal water in the Wood River region to be depleted by about 10 0/00 in D and by 1 to 2 0/00 in (18)0 relative to cold water. This suggests the water could be meteoric water that fell during the late Pleistocene. The geological data, as well as the chemical data, indicate the geothermal waters are heated at depth, and subsequently migrate along permeable structural zones. In almost all cases the chemical data suggest slightly different thermal histories and recharge areas for the water issuing from the hot springs. Sustained use of the thermal water at any of the identified springs is probably limited to flow rates approximating the existing spring discharge. DOE

N86-12748# Bohan (Walter A.) Co., Park Ridge, Ill.
HYDROLOGIC AND LAND SCIENCES APPLICATIONS OF NOAA (NATIONAL OCEANIC AND ATMOSPHERIC ADMINSTRATION) POLAR-ORBITING SATELLITE DATA Final Report
M. Matson and F. Parmenter-Holt Jan. 1985 24 p
(Contract NA83SA-C-00650)
(PB85-233385; HLSB-85) Avail: NTIS HC A02/MF A01 CSCL 14E

The satellite applications training aid focuses on the use of NOAA satellite data for hydrologic applications (snow cover mapping, flood monitoring and soil moisture analysis; Renewable Resources) monitoring vegetation progress and health, forest management, fire monitoring and detection, urban effects, dust storm monitoring, volcanic activity and geologic assessment. Annotated examples of satellite imagery detail the photointerpretation details. GRA

N86-12749# Environmental Protection Agency, Denver, Colo.
TOXIC HOT SPOT STUDY, SOUTH PLATTE RIVER ALONG THE FRONT RANGE, AUGUST AND OCTOBER, 1982
C. E. Runas, M. Martin, D. McDonough, and L. Parrish Oct. 1984 70 p
(PB85-196384; EPA/908/2-84/001) Avail: NTIS HC A04/MF A01 CSCL 08H

To implement a Consent Decree between the EPA and the National Resources Defense Council requiring that EPA identify waters which may have toxic pollution problems, a two phase study was designed to determine if any toxic hot spots exist in selected reaches of the South Platte River and selected tributary and non-tributary streams along the Front Range. Phase 1 was designed to determine if such toxic hot spots exist and Phase 2 would focus on those areas defined in Phase 1 as toxic hot spots and would include additional sampling locations. Samples of water, sediment and aquatic invertebrates were obtained for chemical and biological examination. GRA

N86-12750# Illinois Dept. of Energy and Natural Resources, Springfield.
DESIGN OF A STATEWIDE GROUNDWATER MONITORING NETWORK FOR ILLINOIS
M. OHearn and S. C. Schock Mar. 1985 84 p
(PB85-192821; IL/ENR/RE-85/02) Avail: NTIS HC A05/MF A01 CSCL 08H

The design of a groundwater monitoring network for principal aquifers in Illinois is discussed. The objective of this network is to identify and assess existing groundwater resource problems in Illinois' highest yielding aquifers and to provide base line data in uneffected areas to detect future groundwater problems. The proposed network is based upon the monitoring of 1300 public water supply wells and incorporates a three tier pioritization system to determine the degree to which major aquifers should be monitored for organic and inorganic contaminants. GRA

N86-12751# Environmental Research Lab., Duluth, Minn.
GREAT LAKES: NATURE'S OWN ENVIRONMENTAL LABORATORY
W. L. Richardson 1985 12 p
(PB85-188852; EPA/600/D-85/077) Avail: NTIS HC A02/MF A01 CSCL 08H

The Great Lakes, the world's largest ecosystem and microlab, the history of man's interaction and pollution of it, and the subsequent cleanup ordered by law in recent decades and continuing into the present time are discussed. GRA

N86-12752# Texas Dept. of Water Resources, Austin.
EVALUATING THE GROUND-WATER RESOURCES OF THE HIGH PLAINS OF TEXAS, VOLUME 2
T. Knowles, P. Nordstrom, and W. B. Klemt Aug. 1984 392 p
(PB85-191609; TDWR/R-288-Vol-1) Avail: NTIS HC A17/MF A01; also avail. in set of 4 reports as PB85-191583; MF E99 CSCL 08H

Records of approximately 12,200 wells and county maps depicting well locations in Texas are given. Also, the elevation of the base of the High Plains aquifer, elevation of water levels in 1980, and saturated thicknesses in 1980 are given. GRA

N86-12753# Geological Survey, St. Paul, Minn. Water Resources Div.
WATERS RESOURCES DATA FOR MINNESOTA. WATER YEAR 1983. VOLUME 2: UPPER MISSISSIPPI AND MISSOURI RIVER BASINS Annual Report, 1 Oct. 1982 - 30 Sep. 1983
K. T. Gunard, J. H. Hess, J. L. Zirbel, and C. E. Cornelius Feb. 1985 463 p Prepared in cooperation with Minnesota Dept. of Transportation, St. Paul and Minnesota Dept. of Natural Resources, St. Paul
(PB85-215994; USGS/WRD/HD-85/215; USGS/WRD/MN-83/2) Avail: NTIS HC A20/MF A01 CSCL 08H

Water resources data for the 1983 water year for Minnesota consist of records of stage, discharge and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels and water quality in wells and springs. The volume contains discharge records for 72 gaging stations; stage and contents for 11 lakes and reservoirs; water quality for 25 stream stations, 16 partial record stations, 1 lake station, and 107 wells; and water levels for 238 observation wells. Also included are 107 high flow partial record stations. Author (GRA)

N86-12754# Geological Survey, Tallahassee, Fla. Water Resources Div.
WATER RESOURCES DATA FOR FLORIDA, WATER YEAR 1983. VOLUME 3A: SOUTHWEST FLORIDA SURFACE WATER Water-Data Annual Report, 1 Oct. 1982 - 30 Sep. 1983
R. T. Mycyk, L. D. Fayard, W. L. Fletcher, and J. K. Ogle Mar. 1985 488 p
(PB85-216000; USGS/WRD/HD-85/211; USGS/WDR/FL-84/3A) Avail: NTIS HC A21/MF A01 CSCL 08H

Water resources data for the 1983 water year for southwest Florida include continuous or daily discharge for 74 streams, periodic discharge for 14 streams, miscellaneous discharge for 15 streams, peak discharge for 19 streams, continuous or daily stage for 18 streams; continuous elevations for 43 lakes and periodic elevations for 72 lakes. GRA

N86-12755# National Marine Fisheries Service, Galveston, Tex.
GENERALIZED GEOGRAPHIC MAPPING SYSTEM FOR COMPUTER GRAPHICS
D. B. Koi Apr. 1985 45 p
(PB85-212520; NOAA-TM-MNFS-SEFC-153) Avail: NTIS HC A03/MF A01 CSCL 08B

The Generalized Geographic Mapping System (GGMS) is a computer program that draws accurately proportioned maps virtually anywhere in the world, using a variety of land mass data bases. The GGMS is written in standard FORTRAN IV and is machine-independent except where noted. GGMS is very versatile. It not only generates maps of land masses, but it also makes maximum use of the specific available output screen regardless of the selected borders of the desired output. Two mapping projections, rectangular and Mercator, are available; as are numerous different methods of drawing the graticule (latitude and longitude line grid). The heart of the GGMS is the subroutine MAPP. MAPP is the only GGMS subprogram required to be called before user-defined application routines can be called. Essentially, MAPP computes and draws all borders, draws and labels the graticule, and draws a land mass. GRA

N86-12401# Joint Publications Research Service, Arlington, Va.
CARTOGRAPHY, NATIONAL LAND MANAGEMENT RELATED
Shao Wenxiang *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-035) 17 Oct. 1985 p 34-35 Transl. into ENGLISH from Renmin Ribao (Beijing), 16 May 1984 p 5 (For primary document see N86-12399 03-31)
Avail: NTIS HC A08/MF A01

N86-12402# Joint Publications Research Service, Arlington, Va.
BENEFITS OF SURVEYING, CARTOGRAPHY DESCRIBED
Yu Cang *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-035) 17 Oct. 1985 p 36-39 Transl. into ENGLISH from Renmin Ribao (Beijing), 16 May 1984 p 5 (For primary document see N86-12399 03-31)
Avail: NTIS HC A08/MF A01

N86-12655# Joint Publications Research Service, Arlington, Va.
OIL AND GS DEPOSITS ON CONTINENTAL SLOPES OF THE OCEAN Abstract Only
A. A. Geodekyan, A. Zabanbark, and A. I. Konyukhov *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 24-25 Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 280, no. 2, Jan. 1985 p 423-426 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

44 ENERGY PRODUCTION AND CONVERSION

Includes specific energy conversion systems, e.g., fuel cells and batteries; global sources of energy; fossil fuels; geophysical conversion; hydroelectric power; and wind power.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *85 Urban Technology and Transportation.*

N86-12756# Midwest Energy Inst., Kansas City, Mo.
SOLERAS: PHOTOVOLTAIC POWER SYSTEMS PROJECT. MODULE FAILURE ANALYSIS Interim Report
F. S. Huraib, M. S. Imamura, A. A. Salim, and N. Rao Oct. 1984 100 p refs Sponsored in part by Saudi Arabian National Center for Science and Technology (SANCST)
(MRI/SOL-0101) Avail: NTIS HC A05/MF A01

The SOLERAS Photovoltaic Power System (PVPS) became operational in September 1981. The system has operated satisfactorily and has experienced very little downtime. Early in 1983 some degradation in the photovoltaic (PV) field performance was detected. A series of current voltage (I-V) tests and other analyses eventually uncovered a number of PV modules that have resulted in open circuit type failure in the four cell group, or a half module. As of August 1984, the estimated number of these defective modules in the PV field was 152. In addition, there are a total of 188 defective modules in the storage warehouse, resulting in a total of 340 modules that need repairs. At the current rate of failures (seven half modules per month), an additional 112 modules would be defective by the end of January 1986, resulting in 412 defective modules. This report presents the results of the failure analysis performed during the past several months on the open circuit modules. Background information as related to the module failures and the effects of such failures on the overall PV field power output are provided. In addition, a plan to continue the monitoring of the rate of failure and analyzing the failure mechanisms is presented. Author

N86-12757*# Engelhard Corp., Edison, N.J. Specialty Chemicals Div.

DEVELOP AND TEST FUEL CELL POWERED ON-SITE INTEGRATED TOTAL ENERGY SYSTEMS: PHASE 3, FULL-SCALE POWER PLANT DEVELOPMENT Quarterly Technical Progress Report, Aug. - Oct. 1984

A. Kaufman, S. Pudick, C. L. Wang, J. Werth, and J. A. Whelan 17 May 1985 15 p

(Contracts DEN3-241; DE-AI01-80ET-17088)

(NASA-CR-174948; DOE/NASA-0241-15; NAS 1.26:174948; QR-14) Avail: NTIS HC A02/MF A01 CSCL 10B

Two 25 cell stacks of the 13 inch x 23 inch cell size (about 4kW) remain on test after 4000 hours and 2900 hours, respectively, using simulated reformate fuel. These tests are focusing on the durability of fuel cell stack components developed through the end of 1983. Also, these stacks are serving as forerunners of a 25kW stack that will contain 175 cells of the same size and will employ the same technology base. The stack technology development program has focused on a new, low cost bipolar plate edge seal technique and evaluation of advanced cathode catalysts, an electrolyte replenishment system, and nonmetallic cooling plates in small stacks. Author

N86-12758*# Engelhard Corp., Edison, N.J. Specialty Chemicals Div.

DEVELOP AND TEST FUEL CELL POWERED ON-SITE INTEGRATED TOTAL ENERGY SYSTEMS: PHASE 3, FULL-SCALE POWER PLANT DEVELOPMENT Quarterly Technical Progress Report, Feb. - Apr. 1985

A. Kaufman, S. Pudick, C. L. Wang, J. Werth, and J. A. Whelan 22 Jul. 1985 25 p

(Contract DEN3-241; DE-AI01-80ET-17088)

(NASA-CR-174998; DOE/NASA-0241-17; NAS 1.26:174998; QR-16) Avail: NTIS HC A02/MF A01 CSCL 10B

A 25 cell stack of the 13 inch x 23 inch cell size (about 4kW) remains on test after 6000 hours, using simulated reformate fuel. A similar stack was previously shut down after 7000 hours on load. These tests were carried out for the purpose of assessing the durability of fuel cell stack components developed through the end of 1983. In light of the favorable results obtained, a 25kW stack that will contain 175 cells of the same size is being constructed using the same technology base. The components for the 25kW stack have been completed. A methanol steam reformer with a design output equivalent to 50kW has been constructed to serve as a hydrogen generator for the 25kW stack. This reformer and the balance of the fuel processing sub system are currently being tested and debugged. The stack technology development program focused on cost reduction in bipolar plates, nonmetallic cooling plates, and current collecting plates; more stable cathode catalyst support materials; more corrosion resistant metal hardware; and shutdown/start up tolerance. Author

N86-12759*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

RELIABILITY AND ENGINEERING OF THIN-FILM PHOTOVOLTAIC MODULES. RESEARCH FORUM PROCEEDINGS

R. G. Ross, Jr., ed. and E. L. Royal, ed. 1 Oct. 1985 278 p refs Forum held in Washington, D.C., 20 Mar. 1985

(Contracts NAS7-918; DE-AI01-76ET-20356; JPL Proj. 5101-264) (NASA-CR-176217; DOE/JPL-1012-111; JPL-Pub-85-73; NAS 1.26:176217) Avail: NTIS HC A13/MF A01 CSCL 10A

A Research Forum on Reliability and Engineering of Thin Film Photovoltaic Modules, under sponsorship of the Jet Propulsion Laboratory's Flat Plate Solar Array (FSA) Project and the U.S. Department of Energy, was held in Washington, D.C., on March 20, 1985. Reliability attribute investigations of amorphous silicon cells, submodules, and modules were the subjects addressed by most of the Forum presentations. Included among the reliability research investigations reported were: Arrhenius-modeled accelerated stress tests on a Si cells, electrochemical corrosion, light induced effects and their potential effects on stability and reliability measurement methods, laser scribing considerations, and determination of degradation rates and mechanisms from both laboratory and outdoor exposure tests. For individual titles, see N86-12760 through N86-12774.

N86-12760*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

CRYSTALLINE-SILICON RELIABILITY LESSONS FOR THIN-FILM MODULES

Ronald G. Ross, Jr. *In its* Reliability and Eng. of Thin-Film Photovoltaic Modules 1 Oct. 1985 p 3-11 refs (For primary document see N86-12759 03-44)

Avail: NTIS HC A13/MF A01 CSCL 10A

The reliability of crystalline silicon modules has been brought to a high level with lifetimes approaching 20 years, and excellent industry credibility and user satisfaction. The transition from crystalline modules to thin film modules is comparable to the transition from discrete transistors to integrated circuits. New cell materials and monolithic structures will require new device processing techniques, but the package function and design will evolve to a lesser extent. Although there will be new encapsulants optimized to take advantage of the mechanical flexibility and low temperature processing features of thin films, the reliability and life degradation stresses and mechanisms will remain mostly unchanged. Key reliability technologies in common between crystalline and thin film modules include hot spot heating, galvanic and electrochemical corrosion, hail impact stresses, glass breakage, mechanical fatigue, photothermal degradation of encapsulants, operating temperature, moisture sorption, circuit design strategies, product safety issues, and the process required to achieve a reliable product from a laboratory prototype. Author

N86-12761*# Exxon Research and Engineering Co., Annandale, N.J.

LIGHT-INDUCED EFFECTS-IMPACTS TO MODULE PERFORMANCE MEASUREMENTS AND RELIABILITY TESTING: AN OVERVIEW

C. R. Wronski *In* JPL Reliability and Eng. of Thin-Film Photovoltaic Modules 1 Oct. 1985 p 13-32 refs (For primary document see N86-12759 03-44)

Avail: NTIS HC A13/MF A01 CSCL 10A

The stability of solar cells is a key factor in determining the reliability of photovoltaic modules and is of great interest in the case of solar cells having a new technology which has not yet been fully developed. In particular this question arises with hydrogenated amorphous silicon (a-Si) solar cells because a-Si exhibits reversible light induced changes in its electronic properties, commonly referred to as the Staebler-Wronski effect (SWE). Continuous progress is being made in the peak conversion efficiencies of a-Si solar cells and efficiencies in excess of 11% have been achieved. However, stability is still a problem. ARCO Solar reports results on solar cells which, after over a year's exposure to sunlight, under open circuit conditions, still have about 7% conversion efficiency. Other results show a region of fast

degradation for about a month, after which the degradation diminishes rapidly. Author

N86-12762*# Solarex Corp., Newtown, Pa. Thin Film Div.
THIN-FILM MODULE CIRCUIT DESIGN: PRACTICAL AND RELIABILITY ASPECTS
R. V. DAiello and E. N. Twesme *In* JPL Reliability and Eng. of Thin-Film Photovoltaic Modules 1 Oct. 1985 p 33-46 Sponsored in part by Midwest Research Inst., Golden, Colo. (For primary document see N86-12759 03-44)
Avail: NTIS HC A13/MF A01 CSCL 10A

This paper will address several aspects of the design and construction of submodules based on thin film amorphous silicon (a-Si) p i n solar cells. Starting from presently attainable single cell characteristics, and a realistic set of specifications, practical module designs are discussed from the viewpoints of efficient designs, the fabrication requirements, and reliability concerns. The examples center mostly on series interconnected modules of the superstrate type with detailed discussions of each portion of the structure in relation to its influence on module efficiency. Emphasis is placed on engineering topics such as: area coverage, optimal geometries, and cost and reliability. Practical constraints on achieving optimal designs, along with some examples of potential pitfalls in the manufacture and subsequent performance of a-Si modules are discussed. Author

N86-12763*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
HOT-SPOT HEATING SUSCEPTIBILITY DUE TO REVERSE BIAS OPERATING CONDITIONS
C. C. Gonzalez *In its* Reliability and Eng. of Thin-Film Photovoltaic Modules 1 Oct. 1985 p 47-64 (For primary document see N86-12759 03-44)
Avail: NTIS HC A13/MF A01 CSCL 10A

Because of field experience (indicating that cell and module degradation could occur as a result of hot spot heating), a laboratory test was developed at JPL to determine hot spot susceptibility of modules. The initial hot spot testing work at JPL formed a foundation for the test development. Test parameters are selected as follows. For high shunt resistance cells, the applied back bias test current is set equal to the test cell current at maximum power. For low shunt resistance cells, the test current is set equal to the cell short circuit current. The shadow level is selected to conform to that which would lead to maximum back bias voltage under the appropriate test current level. The test voltage is determined by the bypass diode frequency. The test conditions are meant to simulate the thermal boundary conditions for 100 mW/sq cm, 40C ambient environment. The test lasts 100 hours. A key assumption made during the development of the test is that no current imbalance results from the connecting of multiparallel cell strings. Therefore, the test as originally developed was applicable for single string case only. Author

N86-12764*# Clemson Univ., S.C. Dept. of Electrical and Computer Engineering.
ACCELERATED STRESS TESTING OF THIN FILM SOLAR CELLS: DEVELOPMENT OF TEST METHODS AND PRELIMINARY RESULTS
Jay W. Lathrop *In* JPL Reliability and Eng. of Thin-Film Photovoltaic Modules 1 Oct. 1985 p 65-78 (For primary document see N86-12759 03-44)
Avail: NTIS HC A13/MF A01 CSCL 10A

If thin film cells are to be considered a viable option for terrestrial power generation their reliability attributes will need to be explored and confidence in their stability obtained through accelerated testing. Development of a thin film accelerated test program will be more difficult than was the case for crystalline cells because of the monolithic construction nature of the cells. Specially constructed test samples will need to be fabricated, requiring committment to the concept of accelerated testing by the manufacturers. A new test schedule appropriate to thin film cells will need to be developed which will be different from that used in connection with crystalline cells. Preliminary work has been started to seek thin film schedule variations to two of the simplest tests: unbiased temperature and unbiased temperature humidity. Still to be examined are tests which involve the passage of current during temperature and/or humidity stress, either by biasing in the forward (or reverse) directions or by the application of light during stress. Investigation of these current (voltage) accelerated tests will involve development of methods of reliably contacting the thin conductive films during stress. Author

N86-12765*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
ELECTRICAL SAFETY REQUIREMENTS: IMPLICATIONS FOR THE MODULE DESIGNER
R. S. Sugimura *In its* Reliability and Eng. of Thin-Film Photovoltaic Modules 1 Oct. 1985 p 79-92 refs (For primary document see N86-12759 03-44)
Avail: NTIS HC A13/MF A01 CSCL 10A

Commercial photovoltaic array installations, which include residential and intermediate applications, are subject to building and electrical codes and to product safety standards. The National Electrical Code (NEC) Article 690, titled Solar Photovoltaic Systems, contains provisions defining acceptable levels of system safety and emphasizes the system design and its installation. The Underwriters Laboratories, Inc. (UL), document titled: Proposed First Edition of the Standard for Flat Plate Photovoltaic Modules and Panels, UL-1703, identifies module and panel construction requirements that ensure product safety. Together these documents describe requirements intended to minimize hazards such as shock and fire. Although initial focus of these requirements is on single crystal silicon modules, they are generic in nature, and are equally applicable to high voltage (> 30 Vdc), multikilowatt, thin film systems. A major safety concern is insulation breakdown within the module or array wiring system, or discontinuities within the electrical conductors. These failures can result in ground faults, in circuit arcs, or exposure to hazardous electrical parts. Safeguards are discussed. Author

N86-12766*# Eastman Kodak Co., Rochester, N. Y. Research Labs.
LARGE-AREA THIN-FILM MODULES
Y.-S. Tyan and E. A. Perez-Albuerne *In* JPL Reliability and Eng. of Thin-Film Photovoltaic Modules 1 Oct. 1985 p 95-112 refs (For primary document see N86-12759 03-44)
Avail: NTIS HC A13/MF A01 CSCL 10A

The low cost potential of thin film solar cells can only be fully realized if large area modules can be made economically with good production yields. This paper deals with two of the critical challenges. A scheme is presented which allows the simple, economical realization of the long recognized, preferred module structure of monolithic integration. Another scheme reduces the impact of shorting defects and, as a result, increases the production yields. Analytical results demonstrating the utilization and advantages of such schemes are discussed. Author

N86-12767*# Chronar Corp., Princeton, N.J.
INTERCONNECT RESISTANCE OF PHOTOVOLTAIC SUBMODULES
Hermann Volltrauer, Erten Eser, and Alan E. Delahoy *In* JPL Reliability and Eng. of Thin-Film Photovoltaic Modules 1 Oct. 1985 p 113-124 (For primary document see N86-12759 03-44)
Avail: NTIS HC A13/MF A01 CSCL 10A

Small area amorphous silicon solar cells generally have higher efficiencies than large interconnected submodules. Among the reasons for the differences in performance are the lack of large area uniformity, the effect of nonzero tin oxide sheet resistance, and possibly pinholes in the various layers. Another and usually small effect that can contribute to reduced performance of interconnected cells is the resistance of the interconnection i.e., the series resistance introduced by the metal to tin oxide contact through silicon. Proper processing problems to avoid poor contacts are discussed. Author

N86-12768*# ARCO Solar, Inc., Chatsworth, Calif.
THIN FILM MODULE DEVELOPMENT
Theresa Jester *In* JPL Reliability and Eng. of Thin-Film Photovoltaic Modules 1 Oct. 1985 p 125-136 (For primary document see N86-12759 03-44)
Avail: NTIS HC A13/MF A01 CSCL 10A

The design of ARCO Solar, Inc.'s Genesis G100 photovoltaic module was driven by several criteria, including environmental stability (both electrical and mechanical), consumer aesthetics, low materials costs, and manufacturing ease. The module circuitry is designed as a 12 volt battery charger, using monolithic patterning techniques on a glass superstrate. This patterning and interconnect method proves amenable to high volume, low cost production throughput, and the use of glass serves the dual role of handling ease and availability. The mechanical design of the module centers on environmental stability. Packaging of the glass superstrate circuit must provide good resistance to thermal and humidity exposure along with hi-pot insulation and hailstone impact resistance. The options considered are given. Ethylene vinyl acetate (EVA) is chosen as the pottant material for its excellent weatherability. Author

N86-12769*# Hughes Aircraft Co., Long Beach, Calif.
AMORPHOUS SILICON PHOTOVOLTAIC MODULES AND TEST DEVICES DESIGN, FABRICATION AND TESTING
Matt VanLeeuwen *In* JPL Reliability and Eng. of Thin-Film Photovoltaic Modules 1 Oct. 1985 p 151-166 (For primary document see N86-12759 03-44)
Avail: NTIS HC A13/MF A01 CSCL 10A

In July of 1984, Hughes and JPL initiated a contract for Hughes to design, fabricate and test 10 thin film Amorphous Silicon (a-Si) photovoltaic power modules. These modules were to be 1 ft x 4 ft in size. They were to be preceded by the delivery of 10 a-Si 4 in. square test devices. This effort is very timely since thin film PV development has progressed to the point where intermediate load power applications are on the horizon. It is important to know if current a-Si submodule design and manufacturing processes yield a product that is compatible with the packaging needed to meet a 20 to 30 year life span expectancy. The term submodule is assigned to an interconnected assembly of 28 a-Si cells deposited on a 1 foot square glass superstrate. These assemblies are equipped with electrical terminations, i.e., copper tabs at the four corners of the inverted submodules. It is these submodules that are to be interconnected and packaged into power modules, as opposed to the interconnected individual crystalline cells packaged into todays PV modules. A discussion of the fabrication methods and results follows. Author

N86-12770*# ARCO Solar, Inc., Chatsworth, Calif.
THIN FILM MODULE ELECTRICAL CONFIGURATION VERSUS ELECTRICAL PERFORMANCE
Don L. Morel *In* JPL Reliability and Eng. of Thin-Film Photovoltaic Modules 1 Oct. 1985 p 167-184 refs (For primary document see N86-12759 03-44)
Avail: NTIS HC A13/MF A01 CSCL 10A

The as made and degraded states of thin film silicon (TFS) based modules have been modelled in terms of series resistance losses. The origins of these losses lie in interface and bulk regions of the devices. When modules degrade under light exposure, increases occur in both the interface and bulk components of the loss based on series resistance. Actual module performance can thus be simulated by use of only one unknown parameter, shunt losses. Use of the simulation to optimize module design indicates that the current design of 25 cells per linear foot is near optimum. Degradation performance suggests a shift to approx. 35 cells to effect maximum output for applications not constrained to 12 volts. Earlier studies of energy based performance and tandem structures should be updated to include stability factors, not only the initial loss factor tested here, but also appropriate annealing factors. Author

N86-12771*# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
OUTDOOR PERFORMANCE TESTING OF THIN-FILM DEVICES
In JPL Reliability and Eng. of Thin-Film Photovoltaic Modules 1 Oct. 1985 p 185-196 (For primary document see N86-12759 03-44)
Avail: NTIS HC A13/MF A01 CSCL 10A

The Advanced Systems Research Group supports the photovoltaic advanced R&D (PV AR&D) project by providing outdoor (global) testing of PV cells, submodules, modules, and arrays. The group also provides in house engineering and analysis to identify and determine how technical issues such as cell/module/system adaptations, long term stability, reliability, economics, materials availability, safety, and environmental impacts affect the development and ultimate use of advanced PV thin film, innovative cell, and material technologies. A major thrust of the research effort is to develop and utilize instrumentation and procedures for monitoring and analyzing PV cells and submodules including outdoor performance and stability testing and life cycle accelerated stress testing. To accomplish the above, the solar energy research institute (SERI) outdoor PV test facility was established in 1982. The group has designed testing systems and analysis procedures for, and has tested, numerous amorphous silicon thin film submodules provided by SERI subcontractors and has performed long term outdoor stability tests on CdS/Culr Se sub 2 and hydrogen passivated silicon solar cells. A significant contribution from this facility over the past year was the testing of large area amorphous silicon submodules. Author

N86-12772*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
MODULE VOLTAGE ISOLATION AND CORROSION RESEARCH
Gordon R. Mon *In its* Reliability and Eng. of Thin-Film Photovoltaic Modules 1 Oct. 1985 p 197-234 refs (For primary document see N86-12759 03-44)
Avail: NTIS HC A13/MF A01 CSCL 10A

A summary of recent research at JPL on two topics related to achieving long term reliability of photovoltaic modules: voltage isolation and electrochemical corrosion is presented. Special emphasis is given tc similarities and differences in performance between crystalline silicon modules and amorphous silicon modules. Author

N86-12773*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
GLASS BREAKING STRENGTH: THE ROLE OF SURFACE FLAWS AND TREATMENTS **c27**
Donald Moore *In its* Reliability and Eng. of Thin-Film Photovoltaic Modules 1 Oct. 1985 p 235-248 (For primary document see N86-12759 03-44)
Avail: NTIS HC A13/MF A01 CSCL 11B

Although the intrinsic strength of silicon dioxide glass is of the order of 10 to the 6th power lb/sq in, the practical strength is roughly two orders of magnitude below this theoretical limit, and depends almost entirely on the surface condition of the glass, that is, the number and size of flaws and the residual surface compression (temper) in the glass. Glass parts always fail in tension when these flaws grow under sustained loading to some critical size. Research associated with glass encapsulated crystalline-Si photovoltaic (PV) modules has greatly expanded our knowledge of glass breaking strength and developed sizeable data base for commercially available glass types. A detailed design algorithm is developed for thickness sizing of rectangular glass plates subject to pressure loads. Additional studies examine the strength of glass under impact loading conditions such as that caused by hail. Although the fundamentals of glass breakage are directly applicable to thin film modules, the fracture strength of typical numerical glass must be replaced with data that reflect the high temperature tin oxide processing, laser scribing, and edge processing peculiar to thin film modules. The fundamentals of glass breakage applicable to thin film modules and preliminary fracture strength data for a variety of 1 ft square glass specimens representing preprocessed and post processed sheets from current amorphous-Si module manufacturers are presented. Author

N86-12774*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
ENCAPSULANT SELECTION AND DURABILITY TESTING EXPERIENCE
E. F. Cuddihy *In its* Reliability and Eng. of Thin-Film Photovoltaic Modules 1 Oct. 1985 p 249-274 (For primary document see N86-12759 03-44)
Avail: NTIS HC A13/MF A01 CSCL 10A

The Flat Plate Solar Array Project (FSA) has established technically challenging cost and service life goals for photovoltaic modules. These goals are a cost of $70 sq m and an expected 30 years of service life in an outdoor weathering environment. out of the cost goal, $14 sq m is allocated for encapsulation materials, which includes the cost of a structural panel. At FSA's inception in 1975, the cumulative cost of encapsulation materials in popular use, such as room temperature vulcanized (RTV) silicones, aluminum panels, etc., greatly exceeded $14/sq m. Accordingly, it became necessary to identify and/or develop new materials and new material technologies to achieve the goals. Many of these new materials are low cost polymers that satisfy module engineering and encapsulation processing requirements but unfortunately are not intrinsically weather stable. This necessitates identifying lifetime and/or weathering deficiencies inherent in these low cost materials and developing specific approaches to enhancing weather stability. Author

N86-12775# GTE Labs., Inc., Waltham, Mass. Power Sources Dept.
LITHIUM-THIONYL CHLORIDE CELL SYSTEM SAFETY HAZARD ANALYSIS Final Report, Dec. 1981 - Dec. 1984
F. W. Dampier Mar. 1985 83 p
(Contract F33615-81-C-2070)
(AD-A157089; AFWAL-TR-84-2112) Avail: NTIS HC A05/MF A01 CSCL 06/20

This system safety analysis for the lithium thionyl chloride cell is a critical review of the technical literature pertaining to cell safety and draws conclusions and makes recommendations based on this data. The thermodynamics and kinetics of the electrochemical reactions occurring during discharge are discussed with particular attention given to unstable SOCl2 reduction intermediates. Potentially hazardous reactions between the various cell components and discharge products or impurities that could occur during electrical or thermal abuse are described and the most hazardous conditions and reactions identified. Design factors influencing the safety of Li/SOCl2 cells, shipping and disposal methods and the toxicity of Li/SOCl2 battery components are additional safety issues that are also addressed. GRA

N86-12776# Naval Surface Weapons Center, Silver Spring, Md.
HIGH RATE LI/SOC1(2) CELLS. 1. EFFECT OF DESIGN VARIABLES IN UNCATALYZED CELLS Report, for Nov. 1983 - Apr. 1985
W. P. Kilroy, L. Pitts, and K. M. Abraham Apr. 1985 73 p
(AD-A157203; NSWC/TR-85-98) Avail: NTIS HC A04/MF A01 CSCL 10/3

One of the goals of the Navy's High Energy Batteries for Weapons Block Program is to achieve a better understanding of safety hazards in high energy lithium batteries. To attain this objective, a statistical survey was planned to examine how various cell parameters (cell design, cell balance, catalysis, moisture content, etc.) would affect performance and safety in Li/SOC12 cells. Five replicate tests were planned for each cell parameter during various modes of testing including overdischarge, partial discharge and storage followed by further discharge, etc. Cell performance, and individual electrode potentials, cell internal and external temperatures, and pressure were measured during discharge and forced over-discharge at different rates at ambient and subambient temperatures. The effect of partial discharge and storage on cell performance was assessed. At various stages, the cell chemistry was compared using X-ray, gas chromatography, IR and mass spectrocopy techniques. The effects of water, the presence of a catalyst and lithium vs. cathode-limited cell balance were also examined. The data have been summarized in two reports. This first report primarily addresses the effect of test conditions and cell parameters on performance and chemistry. The second report will discuss the effect of the catalyst. GRA

N86-12777# Naval Weapons Center, China Lake, Calif.
MAINTENANCE OF PHOTOVOLTAIC POWER SYSTEMS, REVISION 1
M. R. Hall Jun. 1985 71 p Previously announced as N85-27390
(AD-A157838; AD-E900491; NWC-TP-6563-REV-1) Avail: NTIS HC A04/MF A01 CSCL 10/2

This publication establishes standard practices for inspection, testing, and maintenance of photovoltaic power systems at Department of the Navy installations. The practices and procedures are recommended to ensure reliable operation of the power systems. The manual covers photovoltaic-array, battery, voltage-regulator, inverter, and wiring subsystems. In addition, this manual provides a troubleshooting guide and self-study questions and answers. GRA

N86-12778# Naval Civil Engineering Lab., Port Hueneme, Calif.
NAVY APPLICATIONS EXPERIENCE WITH SMALL WIND POWER SYSTEMS Report, Jun. 1982 - Jun. 1984
D. Pal May 1985 66 p
(AD-A158561; NCEL-TN-1724) Avail: NTIS HC A04/MF A01 CSCL 10/2

This report describes the experience gained and lesson learned from the ongoing field evaluations of seven small, 2-to 20-kW wind energy conversion systems (WECS) at Navy installations located in the Southern California desert, on San Nicolas Island, in California, and in Kaneohe Bay, Hawaii. The field tests show that the WECS's bearings and yaw slip-rings are prone to failure. The failures were attributed to the corrosive environment and poor design practices. Based upon the field tests, it is concluded that a reliable WECS must use a permanent magnet alternator without a gearbox and yaw slip-rings that are driven by a fixed pitch wind turbine rotor. The present state-of-the-art in small WECS technology, including environmental concerns, is reviewed. Also presented is how the technology is advancing to improve reliability and availability for effectively using wind power at Navy bases. The field evaluations are continuing on the small WECS in order to develop operation, maintenance, and reliability data. GRA

N86-12779# Thermo Electron Corp., Waltham, Mass.
ADVANCED THERMIONIC TECHNOLOGY PROGRAM: SUMMARY REPORT. VOLUME 1 Final Report
Oct. 1984 45 p Prepared in cooperation with Rasor Associates, Inc., Sunnyvale, Calif.
(Contracts DE-AC02-76ET-11292; DE-AC21-83MC-20352)
(DE85-009358; DOE/ET-11292/1893-Vol-1; TE-4258-5-84-Vol-1)
Avail: NTIS HC A03/MF A01

This report summarizes the progress made by the Advanced Thermionic Technology Program during the past several years. This program, sponsored by the US Department of Energy, has had as its goal adapting thermionic devices to generate electricity in a terrestrial (i.e., combustion) environment. The technology has previously been developed for astronautical applications. The report is organized in four volumes, each focused as much as possible on the needs of a particular audience. Volume 1 contains Part A, the Executive Summary. This Executive Summary describes the accomplishments of the Program in brief, but assumes the reader's familarity with the thermionic process and the technical issues associated with the Program. For this reason, Volume 1 also contains Part B, a minimally technical overview of the Advanced Thermionic Technology Program. Volume 2 (Part C) concentrates on the progress made in developing and fabricating the current generation of hemical vapor deposited hot shell thermionic converters and is addressed to those primarily concerned with today's capabilities in terrestrial thermionic technology. Volume 3 (Part D) contains the results of systems studies of primary interest to those involved in identifying and evaluating applications for thermionics. Volume 4 (Part E) is a highly technical

discussion of the attempts made by the program to push the state-of-the-art beyond the current generation of converters and is directed toward potential researchers engaged in this same task. These technical discussions are complemented with Appendices where appropriate. DOE

N86-12780# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
INVESTIGATION OF REACTIVE MAGNETRON SPUTTER DEPOSITED ZnSe FOR SOLAR CELL APPLICATION Final Report
R. J. Stirn and A. Nouhi Aug. 1985 62 p
(Contract DE-AC02-83CH-10093)
(DE85-016851; SERI/STR-211-2750) Avail: NTIS HC A04/MF A01

As a higher bandgap semiconductor with reasonable lattice constant, ZnSe is an attractive alternative to CdS for heterojunction solar cells. Previous attempts to deposit doped n-type polycrystalline ZnSe films usually produced film resistivities from 10(5) to 10(8) ohm-cm unless GaAs substrates were used. This report presents results of one year's research into depositing high-conductivity ZnSe on glass substrates by reactive magnetron sputter deposition, using pure metal sputter targets of Zn and In, Ga, and Al dopants. Using substrate temperatures as low as 150 C and sputter parameters and H2Se injection rates that maximize the Zn-to-Se ratio in the films, ZnSe bulk resistivities were reduced to as low as 40 ohm-cm. The most effective dopant to date was In, co-sputtered with Zn to In atomic concentrations of 3%. AES measurements show an average 45/52 ratio of Zn to Se; a low Zn content for such conducting films. Extended studies of dopants' effects are warranted, as are heterojunction studies using thin-film CuInSe2 and CdTe substrates. DOE

N86-12781# Lockheed Missiles and Space Co., Palo Alto, Calif.
ZINC/FERRICYANIDE BATTERY DEVELOPMENT PHASE 4 Final Report, 9 May 1983 - 15 Feb. 1985
R. P. Hollandsworth, J. Zegarski, and J. R. Selman May 1985 264 p Prepared in cooperation with Illinois Inst. of Tech., Chicago
(Contract DE-AC04-76DP-00789)
(DE85-016026; SAND-85-7195) Avail: NTIS HC A12/MF A01

Project effort was concentrated on the technical evaluation of membrane cycle life of cost-effective membranes; and the study of the alkaline zinc/ferricyanide battery to meet goals of scale-up namely, refinement of a conceptual engineering design for a 50-kW solar photovoltaic storage system; determination of the cycle life of 60, 200, and 1000-sq cm cells operating at capacities between 70 and 200 mAh/sq cm; and, development of compatible bipolar plastic electrode technologies. Numerous cost effective membranes were cyclically evaluated to determine the effects of ferricyanide upon the long term cycle life of the membrane. The results to data indicate a vast improvement over previous tests in that the new membranes endured the ferricyanide electrolyte with minor or no changes in performance during the 100+ cycles at 70-mAh/sq cm capacity cycles which was used for preliminary performance testing. Post-mortem evaluation revealed, however, that changes to the ionic groups attached to the membrane substrate had resulted in ion exchange capacity loss and increased resistance. Present data suggests that the membrane changes occur upon initial exposure to the battery electrolyte as electrochemical testing indicates stable cyclic efficiency performance. DOE

N86-12782# Wisconsin Univ., Milwaukee.
SYNTHESIS OF RESEARCH AND DEVELOPMENT IN MECHANICAL ENERGY STORAGE TECHNOLOGIES Progress Report, 1 Feb. - 31 Aug. 1985
G. M. Karadi May 1985 16 p
(Contract DE-AC02-79ET-26106)
(DE85-013313; DOE/ET-26106-26) Avail: NTIS HC A02/MF A01

Current research in the field of energy storage was synthesized, previous accomplishments and trends have been reassessed, and new research was initiated to improve the understanding of basic phenomena governing aquifer energy storage operations. The research effort on the Environmental and Institutional Aspects of Compressed Air Energy storage was completed and specific guidelines were proposed for planning purposes. The seasonal thermal energy storage component of the ongoing work involved the reassessment of strategies of RD and D efforts and independent research was initiated on multiple aquifer systems which has already resulted in a new approach in the analysis of dispersion in porous media. A new method is advanced for the estimation of the number of heating, freezing and degree days. In the areas of Diurnal Thermal Energy Storage, Solar Thermal Storage, District Heating and Cooling, and Storage for Solar Receivers the various options is studied by reassessing the findings of various research projects and the most promising technologies and/or combinations of technologies will be determined. DOE

N86-12783# Oak Ridge National Lab., Tenn.
ORNL GROUND COIL ANALYTICAL AND EXPERIMENTAL STUDIES
V. C. Mei 1985 5 p refs Presented at the DOE/ORNL Heat Pump Conf., Washington, D.C., 10 Dec. 1984
(Contract DE-AC05-84OR-21400)
(DE85-005246; CONF-841231-15) Avail: NTIS HC A02/MF A01

The goal of this research program is to understand the phenomenon of soil heat transfer coupled with fluid flow, soil moisture freezing, soil moisture migration, and ground surface temperature variation. From these studies, comprehensive ground coil mathematical models are developed to better predict ground coil heat exchanger performance. The program has been loosely divided into three phases. Phase 1 was for ground coils involving heat transfer only, which was suitable for deep-well, tube-in-tube type ground heat exchanger analyses. A mathematical model based on energy balance coupled with fluid flow was solved numerically. The model was validated with laboratory experimental data obtained from a vertical, tube-in-tube heat exchanger 47 m deep are shown and shows the excellent agreement between the calculated and experimental results. The parametric study indicates that the size and material of the exchanger casing and the length of the exchanger are important factors in determining the performance of the ground heat exchanger. Table 1 shows monthly ground coil cooling and heating performance. The ground coil system performs better than an air-source heat pump system in the heating season, but the latter is better for the cooling season. Nevertheless, the ground coil system achieved a respectable annual performance factor of 2.4. Various advanced ground coil models for different types of ground coils and various factors affecting soil heat transfer are developed. DOE

N86-12784# Argonne National Lab., Ill.
DEVELOPMENT OF A SUPPORTED LIQUID MEMBRANE AS A NICKEL-ZINC SECONDARY BATTERY SEPARATOR
D. S. Poa, J. F Miller, and N. P. Yao May 1985 36 p
(Contract W-31-109-eng-38)
(DE85-012591; ANL/OEPM-85-1) Avail: NTIS HC A03/MF A01

A liquid tertiary amine complexing agent was dissolved in an organic solvent and absorbed into and held within the pores of a microporous polymeric film by either capillary or surface force. Screening tests were performed to identify the optimum tertiary amine/organic solvent combinations, and the optimum concentration range of the amine solutions. The treatment of Celgard 2400 microporous film with certain tertiary amine/organic solvent solutions, such as triethylamine/xylene or tripropylamine/xylene, had no significant effect on either zinc penetration resistivity (ZPR) or electrolytic resistivity of the membrane. When the film was treated with tri-n-octylamine solutions of very high amine concentration, the potential difference between the zinc cathode and the Ni(OH)2 counter electrode, the electrolytic resistance of the membrane, increased sharply. Among the tertiary amine solutions tested in this study, trihexylamine/xylene, tri-n-octylamine/toluene, and tri-n-octylamine/xylene appeared to be the most promising, especially the last one. The treatment of the Celgard 2400 film with that solution increased the zinc penetration resistivity of the membrane by as much as 400%. This solution treatment also

improved the electrolytic conductivity of the Celgard 2400 film. DOE

N86-12785# Sandia National Labs., Albuquerque, N. Mex.
CHARACTERIZATION OF SHEET CALCIUM FOR Ca/CaCr04 THERMAL BATTERIES
R. A. Guidotti, F. W. Reinhardt, and G. C. Nelson Apr. 1985 46 p
(Contract DE-AC04-76DP-00789)
(DE85-013231; SAND-83-2269) Avail: NTIS HC A03/MF A01

The physical and chemical properties of sheet calcium were examined in an attempt to explain the varied performance of different lots in five-cell Ca/CaCr04 thermal batteries. Properties evaluated included microhardness, phase and texture analysis, heat capacity, melting point, transition temperature, and heat of transition. The surface chemistry was examined by Auger electron spectroscopy, secondary ion mass spectroscopy, and low-energy ion-scattering spectroscopy. None of these properties could be correlated to battery performance. The bulk chemistry of the calcium was characterized by analysis for metallic and interstitial impurities. Only the nitrogen content exerted any measurable influence upon battery performance, with the best overall results observed for samples with $>$ 0.40% nitrogen. DOE

N86-12786*# Springborn Labs., Inc., Enfield, Conn.
INVESTIGATION OF TEST METHODS, MATERIAL PROPERTIES AND PROCESSES FOR SOLAR CELL ENCAPSULANTS Annual Report
P. B. Willis 1985 101 p Sponsored in part by DOE Prepared for JPL
(Contracts NAS7-100; JPL-954527)
(DE85-012831; NASA-CR-176371; DOE/JPL-95452727/84; NAS 1.26:176371; AR-8) Avail: NTIS HC A06/MF A01 CSCL 10A

The historical development of ethylene vinyl acetate (EVA) is presented, including the functional requirements, polymer selection, curing, stabilization, production and module processing. The construction and use of a new method for the accelerated aging of polymers is detailed. The method more closely resembles the conditions that may be encountered in actual module field exposure and additionally may permit service life to be predicted accurately. The use of hardboard as a low cost candidate substrate material is studied. The performance of surface antisoiling treatments useful for imparting a self cleaning property to modules is updated. DOE

N86-12787# Washington State Energy Office, Olympia.
WIND GENERATION IN WASHINGTON Final Progress Report, 1 Jan. 1984 - 30 Apr. 1985
J. W. James 13 May 1985 3 p
(Contract DE-FG04-81AL-21581)
(DE85-012791; DOE/AL-21581/T1) Avail: NTIS HC A02/MF A01

A Chronology of events describing the activities completed in a wind energy project is presented. The goal of the project was to use energy from a wind turbine to preheat hot water for a Ridgefield, Washington residence. The turbine operated successfully in the spring of 1984 until the yaw mechanism and prop began to fail. An output performance sheet is included which provides estimated energy outputs and wind speeds measured from the year 1979. DOE

N86-12788# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
SOLAR WALK-OFF PROTECTION
H. Awaya and R. Bedard Apr. 1985 68 p Prepared in cooperation with California Inst. of Tech., Pasadena
(Contract DE-AC04-76DP-00789)
(DE85-012112; SAND-84-7019) Avail: NTIS HC A04/MF A01

A point-focus solar concentrator is normally pointed toward the sun during operations to direct concentrated solar flux into the aperture of the receiver. If solar-tracking control is lost, severe damage may occur when the concentrated solar beam moves, or walks off the aperture across the face of the receiver. Alternative methods of solar walk-off prevention/protection for a specific assumed generic dish module and electric plant design are identified. The cost of a baseline case (no walk-off prevention/protection) is first calculated, including initial capital; recurring operating, maintenance, and capital replacement costs; and the cost of restoring the plant to operation following a solar walk-off. The alternative cases (with walk-off prevention/protection) are then evaluated by increasing the solar plant cost as a function of specific walk-off prevention/protection design alternatives and decreasing the cost of walk-off events given the specific level of prevention or protection offered by the alternative cases. The alternative plant designs are then compared with the baseline case and against each other by annualizing all costs. No single walk-off protection solution is universally applicable. Decisions concerning solar walk-off prevention/protection for specific installations must be based on engineering evaluations that consider the alternative choices given a specific plant, dish module, and site. DOE

N86-12789# Brookhaven National Lab., Upton, N. Y.
LOW-COST LIGHT-WEIGHT THIN MATERIAL SOLAR HEATING SYSTEM
W. G. Wilhelm Mar. 1985 9 p Presented at Solar Bldg.: Realities for Today - Trends for Tomorrow, Washington, D.C., 18 Mar. 1985
(Contract DE-AC02-76CH-00016)
(DE85-012531; BNL-36329; CONF-850388-11) Avail: NTIS HC A02/MF A01

Presented in this paper are innovative concepts to substantially reduce the cost of residential solar application. They were based on a research and development approach that establishes cost goals which if successfully met can insure high marketability. Included in this cost goal oriented approach is the additional need to address aesthetics and performance. With such constraints established, designs were initialized, tested, and iterated towards appropriate solutions. These solutions are based on methods for reducing the material intensity of the products, improving the simplicity for ease of production, and reducing the cost of installation. Such a development approach has yielded past proof of concept designs in the solar collector and in the other components that constitute a total solar heating system. DOE

N86-12790# Sandia National Labs., Albuquerque, N. Mex.
SOLAR THERMAL ENERGY SYSTEMS Program Summary, fiscal year 1984
May 1985 142 p Prepared in cooperation with Midwest Research Inst. Golden, Colo. and Sandia National Lab., Livermore, Calif.
(Contracts DE-AC02-83CH-10093; DE-AC04-76DP-00789; DE-AC04-76DR-00789)
(DE85-008793; SERI/SP-271-2662) Avail: NTIS HC A07/MF A01

Research and development conducted within the US Department of Energy's Solar Thermal Technology Program is described. The goal of the program is to advance the engineering and scientific understanding of solar thermal technology and to establish the technology base from which private industry can develop solar thermal power production options. Research areas emphasized include central receivers, distributed receiveres, and solar thermal materials. Brief descriptions are provided of the contractor's activities at the Sandia National Laboratories, Solar Energy Research Institute, and the San Francisco and Albuquerque DOE operations offices. A list of the FY 1984 publications is included. DOE

N86-12791# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
FILM STABILITY FOR DIRCT ABSORPTION RECEIVERS
K. Y. Wang, T. A. Newell (Illinois Univ., Urbana-Champaign), and R. J. Copeland Jun. 1985 6 p Presented at INTERSOL 1985, Solar Energy: The Diverse Solution, Montreal, 23 Jun. 1985
(Contract DE-AC02-83CH-10093)
(DE85-012135; SERI/TP-252-2739) Avail: NTIS HC A02/MF A01

The direct absorption receiver (DAR) concept offers the potential of high temperature operation by using concentrated solar energy. The minimum flow rate and other relevant issues required to maintain a continuous film flowing over the absorption surface are examined. DOE

N86-12792# Institute of Gas Technology, Chicago, Ill.
ABSORPTION FLUIDS DATA SURVEY
R. A. Macriss and T. S. Zawacki 1985 13 p refs Presented at the DOE/ORNL Heat Pump Conf., Washington, D. C., 10 Dec. 1984
(Contract DE-AC05-84OR-21400)
(DE85-005279; CONF-841231-18) Avail: NTIS HC A02/MF A01

Development of improved data for the thermodynamic, transport and physical properties of absorption fluids were studied. A specific objective of this phase of the study is to compile, catalog and coarse screen the available US data of known absorption fluid systems and publish it as a first edition document to be distributed to manufacturers, researchers and others active in absorption heat pump activities. The methodology and findings of the compilation, cataloguing and coarse screening of the available US data on absorption fluid properties and presents current status and future work on this project are summarized. Both in house file and literature searches were undertaken to obtain available US publications with pertinent physical, thermodynamic and transport properties data for absorption fluids. Cross checks of literature searches were also made, using available published bibliographies and literature review articles, to eliminate secondary sources for the data and include only original sources and manuscripts. The properties of these fluids relate to the liquid and/or vapor state, as encountered in normal operation of absorption equipment employing such fluids, and to the crystallization boundary of the liquid phase, where applicable. The actual data were systematically classified according to the type of fluid and property, as well as temperature, pressure and concentration ranges over which data were available. Data were sought for 14 different properties: Vapor-Liquid Equilibria, Crystallization Temperature, Corrosion Characteristics, Heat of Mixing, Liquid-Phase-Densities, Vapor-Liquid-Phase Enthalpies, Specific Heat, Stability, Viscosity, Mass Transfer Rate, Heat Transfer Rate, Thermal Conductivity, Flammability, and Toxicity. DOE

N86-12793# South Dakota Office of Energy Policy, Pierre.
SMALL SCALE WIND ENERGY CONVERSION PROGRAMMATIC EQUIPMENT Final Report
S. Wegman 20 May 1985 63 p
(Contract DE-FG04-82AL-20860)
(DE85-012319; DOE/AL-20860/T1) Avail: NTIS HC A04/MF A01

The purpose of this project is to provide South Dakota citizens with a case study of the institutional and technical problems encountered in the installation, maintenance and use of a small wind energy system. The project will provide information on wind turbine reliability, maintenance requirements and power production to demonstrate the feasibility of small-scale wind energy conversion projects for South Dakota. The system was installed by vocational students and instructors at Mitchell Vocational School. It has been in operation since the fall of 1983. DOE

N86-12794# Sandia National Labs., Albuquerque, N. Mex.
PHOTOVOLTAIC CONCENTRATOR TECHNOLOGY PROJECT THIRTEENTH PROJECT INTEGRATION MEETING
May 1985 282 p Meeting held in Albuquerque, N. Mex., 4 Jun. 1984
(Contract DE-AC04-76DP-00789)
(DE85-013253; SAND-85-0791/1; CONF-8506140) Avail: NTIS HC A13/MF A01

The proceedings for a meeting on photovoltaic concentrator technology held in Albuquerque, NM on June 4 and 5, 1985 are reported. The meeting covered research on photovoltaic concentrators and their components, included: concentrator cells, cell assemblies, fresnel lenses, concentrator modules, tracking structures and control systems, and complete concentrator arrays. Abstracts of presentations and status reports for current research contracts are presented. DOE

45 ENVIRONMENT POLLUTION

Includes air, noise, thermal and water pollution; environment monitoring; and contamination control.

N86-12795# Lawrence Livermore National Lab., Calif.
REAL-TIME COMPUTING OF THE ENVIRONMENTAL CONSEQUENCES OF AN ATMOSPHERIC ACCIDENTAL RELEASE OF RADIOACTIVE MATERIAL: USER'S POINT OF VIEW
G. Boeri, R. Caracciolo, and M. Dickerson Jul. 1985 16 p refs Presented at the Workshop on Real-Time Computing of the Environ. Consequences of an Accidental Release to the Atmosphere from a Nucl. Installation, Luxembourg, 17 Sep. 1985
(Contract W-7405-eng-48)
(DE85-016438; UCRL-93116; CONF-8509130-2) Avail: NTIS HC A02/MF A01

All calculations of the consequences of an atmospheric release must start with atmospheric dispersion calculations. Time factors make external and inhalation dose estimates of immediate concern closely followed by ground contamination of land, pastures and onch agricultural crops. In general, the difficulties in modeling the source term and atmospheric transport and diffusion account for most of the error in calculating the dose to man. Thus, sophisticated treatment of the dose part of the calcuating is not usually justified, though the relative distribution of dose in individual organs may be needed for correct decision making. This paper emphasizes the atmospheric transport and diffusion part of the dose estimate and relates how this calculation can be used to estimate dose. DOE

N86-12796# Brookhaven National Lab., Upton, N. Y.
PERSPECTIVES TO ESTABLISH KNOWLEDGE LINKAGES BETWEEN ACIDIC DEPOSITION AND VEGETATION RESPONSES
L. S. Evans and K. F. Lewin 1985 15 p Presented at the NATO ARW Conf. on Effects of Acidic Deposition on Forests, Wetlands and Agr. Ecosystems, Toronto, 12 May 1985 Prepared in cooperation with Manhattan Coll., N.Y.
(Contract DE-AC02-76CH-00016)
(DE85-011839; BNL-36452; CONF-8505156-2) Avail: NTIS HC A02/MF A01

This paper provides perspective for present and planned reseach that seeks to establish a knowledge linkage between acidic deposition and vegetation responses. The paper can be divided into three sections: (1) experimental approaches necessary to establish knowledge linkages between acidic deposition and vegetation responses; (2) perspectives obtained from an established air pollutant (ozone) - vegetation (ponderosa pine) response linkage; and (3) current obstacles to overcome in order to establish an information linkage between acidic deposition and forest decline in the northern Appalachians. DOE

N86-12797# Mound Lab., Miamisburg, Ohio.
OUTDOOR RADON MONITORING AT CANONSBURG, PENNSYLVANIA, 1980-1983
C. R. Rudy, P. H. Jenkins, G. R. Hagee, J. C. Miles, and W. G. Yates 31 May 1985 41 p
(Contract DE-AC04-76DP-00053)
(DE85-013320; MLM-3254) Avail: NTIS HC A03/MF A01

This report summarizes the results of radon measurements from January 1980 to July 1983 near the former Vitro Manufacturing Plant located in Canonsburg, Pennsylvania. During this period, radon monitoring was performed on a continuous basis at 40 to 50 minitoring locations surrounding the site. Weekly measurements ere made using Passive Environmental Radon Monitors (PERMs) at these locations. In addition, meteorological measurements were made at the same time using a weather station located at the site. The results indicate that increased radon concentrations

occur downwind of the site. The maximum off-site concentration measured was 0.93 pCi/L (39-month average). The maximum on-site concentration measured was 3.0 pCi/L (11-month average). Background outdoor radon concentrations ranged from 0.20 to 0.26 pCi/L. Positive correlations are noted between radon concentrations and inverse wind speed and calm periods. A negative correlation is observed between precipitation frequency and radon concentration during weekly monitoring periods. DOE

N86-12798# Miami Univ., Fla. School of Marine and Atmospheric Sciences.

ATMOSPHERIC TRITIUM 1968-1984

H. G. Oestlund and A. S. Mason Apr. 1985 152 p refs
(Contract DE-AS05-76FV-03944)
(DE85-013133; DOE/EV-03944/20; Rept-14) Avail: NTIS HC A02/MF A01

Tritium in the form of water, HTO, from the atmospheric testing of nuclear devices in the 60s has disappeared from the atmosphere and entered the ocean. The additions of such tritium from Chinese and French tests in the 70s were observed but did not make a big impression on the diminishing inventory of atmospheric HTO. Tritium in elemental form, HT, went through a maximum in the mid 70s, primarily as a results of some underground testing of large nuclear devices and releases from civilian and military nuclear industry. The mid 70s maximum was 1.3 kg of tritium in this form, and in 1984 0.5 kg remain. The disappearance is slower than the decay rate of tritium, so sources must still have been present during this time. The global distribution shows smaller inventory in the Southern Hemisphere across the equator and thus southward transport of HT. The chemical lifetime of hydrogen gas in the atmosphere, assuming the elemental tritium being in the form of HT, not T2, was estimated between 6 and 10 years. It is expected that increasing activity of nuclear fuel reprocessing would in the near future again increase the global tritium gas inventory. Tritium in the form of light hydrocarbons, primarily methane, was measured, and in this form a quantity of 200 g of tritium resided in the global atmosphere 1956 to 1976. By 1982 it had decreased to 50 g. DOE

N86-12799# Pacific Northwest Lab., Richland, Wash.

STATISTICAL METHODS FOR ENVIRONMENTAL POLLUTION STUDIES

R. O. Gilbert Jun. 1985 13 p
(Contract DE-AC06-76RI-01830)
(DE85-005298; PNL-SA-12373) Avail: NTIS HC A02/MF A01

Design and analysis of environmental contaminant data is reviewed. The major tasks required to conduct a successful environmental sampling study followed by a summary of the principal field sampling designs that are commonly needed. Several criteria for choosing the most appropriate sampling designs are discussed. Some of the problems commonly encountered when statistically analyzing pollution data are considered. DOE

N86-12800# Pacific Northwest Lab., Richland, Wash.

INTERPRETATION OF INDIVIDUAL PRECIPITATION CHEMISTRY DATA SETS: GENERAL CONSIDERATIONS AND APPROACHES

E. G. Chapman Apr. 1985 13 p Presented at the EPA/USGS/EPRI Workshop on Acid Deposition Monitoring and Anal., Raleigh, N. Car., 30 Apr. 1985
(Contract DE-AC06-76RL-01830)
(DE85-012449; PNL-SA-13153; CONF-8504158-1) Avail: NTIS HC A02/MF A01

The operation of precipitation chemistry monitoring networks is an important component of research efforts to understand acid deposition processes. Operation of such networks includes locating sites, collecting precipitation, and analyzing samples, and conducting a comprehensive quality control/quality assurance program, and preparing and utilizing a high quality data set. The analysis and interpretation of individual data sets are addressed. A common thread through each of these papers is that of data flagging; the criteria for data flagging, the handling of flagged data, and the problems that unflagged data can create. This thread underscores the point that data quality affects all aspects of acid precipitation research. The purpose of this paper is threefold: (1) to identify the major components that influence interpretation of individual precipitation chemistry data sets; (2) to suggest a framework for analyzing individual data sets that provides a built in system for determining the influence of these components; and (3) to identify potential areas for standardization that will aid the data analyst. DOE

N86-12801# Tennessee Univ., Chattanooga. Div. of Air and Water Resources.

ACIDIFICATION TRENDS IN SURFACE WATERS OF THE SOUTHERN APPALACHIANS Final Report

H. Olem Mar. 1985 153 p refs
(DE85-901746; TVA/ONRED-AWR-85/13) Avail: NTIS HC A08/MF A01

Historical data was reviewed to identify any spatial or temporal trends in surface water pH and alkalinity in the Southern Blue Ridge Province of Georgia, North Carolina, Tennessee, and Virginia. DOE

N86-12802# Purdue Univ., West Lafayette, Ind.

FISCAL YEAR 1983 PROGRAM REPORT OF THE PURDUE (INDIANA) WATER RESOURCES RESEARCH CENTER Report, 1 Jun. 1983 - 31 Dec. 1984

J. H. Cushman Dec. 1984 28 p
(Contract DI-14-08-0001-G-841)
(PB85-225829; USGS/G-841-01) Avail: NTIS HC A03/MF A01 CSCL 08H

A compilation of project summaries for the Fiscal Year 1983 is given. These projects include studies of groundwater pollutant transport, overland flow, control of non-point pollution control, growth of mussels, simulation of drought management, and technology transfer. GRA

N86-12803# National Bureau of Standards, Gaithersburg, Md. Building Physics Div.

INDOOR AIR QUALITY MODELING WORKSHOP REPORT

P. E. McNail May 1985 16 p Workshop held Gaithersburg, Md., 11 Feb. 1985 Sponsored in part by Environmental Monitoring Systems Lab.
(PB85-212306; NBSIR-85/3150) Avail: NTIS HC A02/MF A01 CSCL 13B

Comprehensive modeling of emission, absorption, movement, and controls of indoor air contaminants is essential for developing national policy for assessment and controls. Several topics discussed in a workshop on indoor air quality, which was held on February 11, 1985 at the National Bureau of Standards are presented. Researchers on indoor air quality (IAQ) modeling were invited to state their current activities, identify future research needs and recommend specific parameters and contaminants to be included in the IAQ models. The input thus obtained in this workshop will be incorporated in an advanced simulation model for IAQ, to be developed by NBS under a contract with EPA. GRA

N86-12804# Environmental Protection Agency, Research Triangle Park, N.C. Environmental Monitoring Systems Lab.

ASSESSMENT OF THE LONG-TERM PRECISION OF CONTINUOUS EMISSION MONITORS

R. Rollins, T. J. Logan, and M. R. Midgett 1985 16 p refs
(PB85-201150; EPA-600/D-85-111) Avail: NTIS HC A02/MF A01 CSCL 14B

The EPA has promulgated regulations requiring certain stationary sources to show continual compliance with emission limits, by using a Continuous Emission Monitoring System (CEMS). In order to make reliable compliance determinations, the quality of the monitoring data is important. Two principal parameters in assessing and describing data quality are precision and accuracy. The paper discusses the long term precision for five CEM's installed at scrubber controlled, coal fired power plants. Precision estimates were made by utilizing available daily calibration drift data. Six to seven months of calibration drift data were analyzed for each pollutant (SO2, NOx) and diluent (O2, CO2) analyze in the CEMS.

Results show that most of the monitors exhibited significant bias and variance over the months involved. Author (GRA)

N86-12805# Environmental Protection Agency, Research Triangle Park, N.C.

SUMMARY OF PRECISION AND ACCURACY ASSESSMENTS FOR THE STATE AND LOCAL AIR MONITORING NETWORKS, 1982

E. G. Evans, R. C. Rhodes, W. J. Mitchell, and J. C. Puzak Apr. 1985 151 p

(PB85-208171; EP1/600/4-85/031) Avail: NTIS HC A08/MF A01 CSCL 13B

Precision and accuracy data obtained from State and local agencies during 1982 are summarized and evaluated. Some comparisons are made with the results previously reported for 1981 to determine the indication of any trends. Some trends indicating improvement in the precision and accuracy of monitoring data are given on a national and regional basis. The annual average results from each reporting organization are given so that comparisons may be made from 1981 to 1982 and also with other reporting organization. A comparison of the precision and accuracy from the Precision and Accuracy Reporting System and that from the independent performance audit program conducted by the Environmental Monitoring Systems Laboratory is given. GRA

N86-12806# Radian Corp., Austin, Tex.

EVALUATION OF AIR EMISSIONS FROM HAZARDOUS WASTE TREATMENT, STORAGE AND DISPOSAL FACILITIES Final Report, Jun. 1982 - Jun. 1984

W. D. Balfour, R. G. Wetherold, and D. L. Lewis May 1985 81 p refs

(Contract EPA-68-02-3171)

(PB85-203792; EPA-600/2-85/057) Avail: NTIS HC A05/MF A01 CSCL 13B

The fugitive air emissions from landfills surface impoundments, storage tanks, containers (drums), solvent recovery processes, and land treatment technologies at hazardous waste disposal facilities (HWDF's) are discussed. The main objective was to develop and demonstrate techniques for determining air emissions from the above HWDF technologies (sources). Various predictive models for estimation air emissions exist for some of the these sources. These models have been identified and evaluated for procedures for applicability to select HWDF's. Sampling approaches have been identified for the collection and qualitative and quantitative analysis of the samples. The resulting analytical data have provided general information on the level of air emissions from the sources studied. The findings from each of four HWDF's tested are given. GRA

N86-12807# National Oceanic and Atmospheric Administration, Rockville, Md. Air Resources Lab.

ANALYSIS AND ASSESSMENT OF US-WMO REGIONAL PRECIPITATION CHEMISTRY MEASUREMENTS (1972-1982), A SUBJECT OF THE NATIONAL TRENDS NETWORK

R. S. Artz and J. M. Miller Feb. 1985 274 p

(PB85-212959; NOAA-TM-ERL-ARL-135) Avail: NTIS HC A12/MF A01 CSCL 04A

Data from the entire sampling period (1972-1982) for all sites in the National Trends Network and its predecessors are presented. Annual and monthly (where appropriate) volume weighted means, medians, and standard deviations are included. Selected graphs of annual statistics are also shown. Analysis of these data indicates improvement in data quality since 1980 for all ions measured and at all sites. Post-1980 data is of high quality, well documented, and should be useful for most studies requiring a regional data base. Pre-1980 data are of lesser quality and not sufficiently accurate for seasonal evaluation or annual trend analysis. GRA

N86-12808# Cornell Univ., Ithaca, N.Y. Center for Environmental Research.

DIAGNOSING THE CAUSES OF GROUND-WATER CONTAMINATION USING A MATHEMATICAL MODEL: REPORT ON TECHNOLOGY TRANSFER WORKSHOP

S. Pacenka Sep. 1984 42 p

(PB85-217008; USGS/G-859(23)) Avail: NTIS HC A03/MF A01 CSCL 08H

Ground-water contamination casese are now being detected at a rate faster than the capability of regulatory agencies to diagnose and solve them. Automation, in the form of low-cost microcomputers and simple mathematical models of contaminant behavior, can help to gain control of the growing backlog of cases. These tools can amplify the skills of the limited number of specialists in the area now employed by the key agencies such as state-level environmental and health departments. Since the same tools can also be used in advance planning for the prevention of ground-water contamination, they could also help to foster the transition from the current, crisis-driven system to one which detects potential problems early and eventually prevents them before they start. A technology transfer workshop which employed microcomputers and associated software in training agency specialists about the movement and fate of groundwater contaminants is described. GRA

N86-12809# Analytical Sciences Corp., Research Triangle Park, N.C.

SPATIAL AND TEMPORAL PATTERNS OF ACID PRECIPITATION AND THEIR INTERPRETATION

S. K. Seilkop and P. L. Finkelstein Jun. 1985 18 p

(Contract EPA-68-02-4082)

(PB85-214377; EPA/600/D-85/113) Avail: NTIS HC A02/MF A01 CSCL 13B

Using data compiled from seven nationwide precipitation chemistry networks in the U.S. and Canada, the spatial distribution of hydrogen, sulfate, and nitrate ions in North America is discussed. Geographic patterns of concentration and deposition are characterized using isopleth maps which are presented and interpreted for the years 1980, 1981, and 1982. The maps were developed using a geostatical technique known as 'kriging'. This method allows for the estimation of confidence limits on interpolated values. Using these limits, the significance of temporal changes in spatial patterns of deposition and concentration is assessed. GRA

N86-12810# Rhode Island Univ., Kingston.

ACID PRECIPITATION: SOURCE IDENTIFICATION AND ITS EFFECTS ON WATER QUALITY

C. P. C. Poon and T. Wright Sep. 1984 92 p

(PB85-214880; USGS/G-867(04)) Avail: NTIS HC A05/MF A01 CSCL 13B

Three small watersheds in the rural area of R.I. were studied for the effects of acid precipitation on the water quality. All three rivers namely, Wood, Beaver, and Usquepaug, have Class A high water quality with very low alkalinity. Storm tracks were identified by using sequential meteorological maps including satellite photos, radar precipitation scans, and pressure maps. Precipitation samples were titrated and their acid components were quantified by the Gran Plot technique. Storms from the west and southwest direction usually carry more acids than those from west-northwest and south-southwest. All storms have similar effects on the three rivers with the chemistry change more pronounced for the Beaver river because of its smallest size. A large storm or a small storm but with high acid concentrations often reduced the alkalinity of the river water to less than 1.0 mg/l. GRA

N86-12843*# Saskatchewan Univ., Saskatoon. Inst. of Space and Atmospheric Studies.

SASKATOON M. F. RADAR SYSTEM: (52 DEG N, 107 DEG W), CANADA Abstract Only

A. H. Manson and C. E. Meek *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 17 Aug. 1985 p 52-56 refs (For primary document see N86-12837 03-46)

Avail: NTIS HC A07/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04A

N86-12676# Joint Publications Research Service, Arlington, Va.
INFLUENCE OF SOME OCEANOGRAPHIC CHARACTERISTICS ON DECAY KINETCIS OF SURFACE-ACTIVE AGENTS IN SEA Abstract Only
N. I. Ryasintseva, V. V. Malyshkina, and L. Yu. Sekundyak *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 45 Transl. into ENGLISH from Okeanol. (Moscow), v. 25, no. 1, Jan. - Feb. 1985 p 88-92 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

N86-12692# Joint Publications Research Service, Arlington, Va.
DAMPING OF HIGH-FREQUENCY WIND WAVES BY ARTIFICIAL SURFACE-ACTIVE FILMS Abstract Only
S. A. Yermakov, A. R. Panchenko, and T. G. Talipova *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 74 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atm. i Okeana (Moscow), v. 21, no. 1, Jan. 1985 p76-82 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

N86-12693# Joint Publications Research Service, Arlington, Va.
ORGANIC COMPONENTS IN ATMOSPHERE IN REGIONS OF VOLCANIC ACTIVITY Abstract Only
V. A. Isidorov and I. G. Zenkevich *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 75 Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 280, no. 1, Jan. 1985 p 223-227 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

N86-12695# Joint Publications Research Service, Arlington, Va.
GLOBAL MODELING OF OPTICAL CHARACTERISTICS OF ATMOSPHERIC AEROSOL Abstract Only
K. Ya. Kondratyev, N. I. Moskalenko, S. Ya. Skvortsova, A. R. Zakirova, F. S. Yakupova, and S. V. Gusev *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 76-77 Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 280, no. 5, Feb. 1985 p 1090-1093 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

N86-12696# Joint Publications Research Service, Arlington, Va.
DIURNAL VARIATION OF OPTICAL AND MICROPHYSICAL CHARACTERISTICS OF NEAR-SURFACE AEROSOL Abstract Only
V. N. Sidorov, G. I. Gorchakov, A. S. Yemilenko, and M. A. Sviridenkov *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 78 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atm. i Okeana (Moscow), v. 20, no. 12, Dec. 1984 p 1156-1165 Original language document was announced in IAA as A85-20831 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

N86-12703# Joint Publications Research Service, Arlington, Va.
ESTIMATION OF INFLUENCE OF OCEAN ON DISTRIBUTION OF HEAVY METALS IN MARINE ATMOSPHERE Abstract Only
V. V. Anikiyev, V. I. Ilichev, A. A. Lobanov, and A. N. Medvedev *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-008) 16 Aug. 1985 p 9 Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 281, no. 4, Apr. 1985 p 937-940 (For primary document see N86-12697 03-42)
Avail: NTIS HC A04/MF A01

46 GEOPHYSICS

Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism.

For space radiation see *93 Space Radiation.*

N86-12811 Illinois Univ., Urbana-Champaign.
THE DYNAMIC STABILITY OF THE STRATOSPHERE AND MESOSPHERE Ph.D. Thesis
Ke-Su Zhang 1985 201 p
Avail: Univ. Microfilms Order No. DA8511696

The normal modes of large-scale atmospheric motions have been examined in a spherical quasi-geostrophic model extending from the surface up to 80 km to investigate the stability of zonal motions in the stratosphere and mesosphere. Two sets of calculations were performed. In the first set, the basic states are representative of the Northen Hemisphere winter and summer solstice conditions. The winter basic state is able to support baroclinically unstable, quasi-stationary planetary waves, which extend into the stratosphere and the mesosphere from the troposphere at high latitudes. They are identified as Green modes. The structure of the unstable Green mode compares favorably with the observed quasi-stationary planetary waves. In the second set, a comparison is made of the stabilities of the stratospheric basic states before and after the 1976/1977 sudden warming event. Dissert. Abstr.

N86-12812 Northwestern Univ., Evanston, Ill.
SEISMOLOGICAL STUDIES OF THE TECTONICS OF DIVERGENT PLATE BOUNDARIES Ph.D. Thesis
Joseph Francis Engeln 1985 147 p
Avail: Univ. Microfilms Order No. DA8511816

Earthquakes on major Atlantic transform faults were studied. Most of the events show transform-parallel strike-slip motion on steeply dipping planes. A number of earthquakes with anomalous mechanisms occur near ridge-transform intersections where the thermal contrast is greatest and stress orientations can be oblique to both the ridge and transform. Centroid depths, determined by body wave waveform inversion, occur above the 400 C isothermal of the expected thermal structure. The maximum depth extent of faulting predicted by scaling laws corresponds to the predicted 600 C isotherm. Centroid depths for oceanic intraplate earthquakes extent to approximately the 750 C isotherm. Since transforms have higher strain rates than intraplate areas, if both have the same rheology the limiting isotherm for transforms should be higher. If a weather rheology is more appropriate, the higher strain rate and weakening effects yielding a limiting isotherm similar to that for intraplate regions. It thus appears that transforms are either weaker and/or have higher temperatures than expected. Dissert. Abstr.

N86-12813 State Univ. of New York, Stony Brook.
THEORETICAL MODELLING OF THE ELASTIC PROPERTIES OF MANTLE SILICATES Ph.D. Thesis
Andrew Yu-Chung Au 1984 146 p
Avail: Univ. Microfilms Order No. DA8513508

The elastic properties of a crystalline solid are not only the manifestation of two-body central forces, but also of noncentral and many-body forces within the crystal structure. Conventional lattice calculations, by adopting the atomistic scale as the fundamental modelling unit, are inadequate in addressing the phenomenon of cooperative interactions in atomic clusters-the non-central and many-body forces. A modified rigid-ionn model is developed based on coordination polyhedra as the fundamanetal modelling units in a crystal structure. The crystal structure is represented by its constituent coordination polyhedra that are treated as three-dimensional elastic continua. Elastic moduli, experimentally determined or otherwise assumed, are ascribed to these coordination polyhedra. Finite element analysis is applied to retrieve the interatomic force information implicit in the elastic moduli of such a polyhedron. Dissert. Abstr.

N86-12814*# International Council of Scientific Unions, Urbana, Ill.
MIDDLE ATMOSPHERE PROGRAM. HANDBOOK FOR MAP. VOLUME 16: ATMOSPHERIC STRUCTURE AND ITS VARIATION IN THE REGION 20 TO 120 km. DRAFT OF A NEW REFERENCE MIDDLE ATMOSPHERE
K. Labitzke, ed. (Freie Univ.), J. J. Barnett, ed. (Oxford Univ.), and B. Edwards, ed. Jul. 1985 323 p refs Sponsored in part by UNESCO
(NASA Order W-15897)

(NASA-CR-176321; NAS 1.26:176321; MAP-HANDBOOK-16) Avail: NTIS HC A14/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04B

A draft of a new reference atmosphere for the region between 20 and 80 km which depends largely on recent satellite experiments covering the globe from 80 deg S to 80 deg N is given. A separate international tropical reference atmosphere is given, as well as reference ozone models for the middle atmosphere. For individual titles, see N86-12815 through N86-12836.

N86-12815*# Oxford Univ. (England). Dept. of Atmospheric Physics.

TEMPERATURE DATA FROM SATELLITES

J. J. Barnett and M. Corney *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 16 Jul. 1985 p 3-11 refs (For primary document see N86-12814 03-46)

Avail: NTIS HC A14/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04B

Several satellites and sounding systems used for measuring the temperature of the middle atmosphere are discussed. Retrieval methods, geopotential height data, the merging of data sets, and an analysis of long term temperature trends are discussed. R.J.F.

N86-12816*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

TEMPERATURE AND WIND DATA FROM METEOROLOGICAL ROCKETS

F. J. Schmidlin *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 16 Jul. 1985 p 12-14 refs (For primary document see N86-12814 03-46)

Avail: NTIS HC A14/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04B

A brief history of the use of meteorological rockets in gathering temperature and wind data in the upper atmosphere is given. The validity of data is discussed. R.J.F.

N86-12817*# Institute of Applied Geophysics, Moscow (USSR). Central Aerological Observatory.

OBSERVED WINDS AND TEMPERATURES IN THE SOUTHERN HEMISPHERE

Yu. P. Koshelkov *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 16 Jul. 1985 p 15-35 refs (For primary document see N86-12814 03-46)

Avail: NTIS HC A14/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04B

A brief account is given of efforts to measure the winds and temperature in the Southern Hemisphere. Results of rocketsonde soundings are analyzed. R.J.F.

N86-12818*# Saskatchewan Univ., Saskatoon. Inst. of Space and Atmospheric Studies.

MEAN WINDS OF THE MESOSPHERE (60-80 km), AS MEASURED BY MF RADARS

A. H. Manson, C. E. Meek, R. A. Vincent (Adelaide Univ.), and M. J. Smith (Inst. of Nuclear Sciences) *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 16 Jul. 1985 p 36-46 refs (For primary document see N86-12814 03-46)

Avail: NTIS HC A14/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04B

Winds data obtained from medium frequency (MF) radars for heights of 60 to 80 km are discussed: locations are Saskatoon (52 N, 107 W), Christchurch (44 S, 173 W), Adelside (35 S, 183 E) and Townsville (20 S, 147 E). Whereas well defined summer easterly jets centered near 70 km develop in summer, no regular buildups and decays are observed in winter at midlatitudes. Part of this variability can be associated with stratospheric warmings, which develop into breakdown of the polar vortex in the Northern Hemisphere. Amplitude and phase profiles of the annual and semiannual oscillations are also presented. The radar winds from Saskatoon are compared and combined with rocket derived winds up to 60 km from Primrose Lake (54 N, 110 W) to give consistent cross sections from 20 to 110 km. The SH radar winds are compared with a model based on rocket winds which extends up to 80 km. The latter evidence considerable smoothing, as no winter variability is evident. The other consistent difference is that heights of the summer easterly maxima for the model are 5 to 10 km lower than the radar winds at all latitudes. Author

N86-12819*# Oxford Univ. (England). Dept. of Atmospheric Physics.

MIDDLE ATMOSPHERE REFERENCE MODEL DERIVED FROM SATELLITE DATA

J. J. Barnett and M. Corney *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 16 Jul. 1985 p 47-85 refs (For primary document see N86-12814 03-46)

Avail: NTIS HC A14/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04B

Zonally averaged temperature and geostrophic zonal wind for each month and for latitudes from 80 S to 80 N with pressure scale height as a vertical coordinate are given tabular form. The pressure scale height is defined as -ln (p/P sub O) where p is pressure and P sub O is surface pressure. The height interval corresponding to one pressure scale height is proportional to absolute temperature, and is 7 km at 240 K. Values in are given at intervals of 0.5 pressure scale heights, i.e., approximately 3,5 km. The geopotential height fields for the principal seasons are given. Temperature, pressure and density with geometric height as the vertical coordinate at invervals of 5 km. The temperature values were obtained from a combination of satellite data above 30 mb with values supplied by the Berlin Free University at 30 mb and the climatology derived by OORT (1983) for 50 mb and below. The geopotential height fields were obtained from these temperature fields by integrating up and down from the 30 mb geopotential height supplied by Berlin Free University. The geostrophic winds were obtained by differentiating these geopotential height fields. Author

N86-12820*# Oxford Univ. (England). Dept. of Atmospheric Physics.

PLANETARY WAVES

J. J. Barnett and M. Corney *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 16 Jul. 1985 p 86-137 (For primary document see N86-12814 03-46)

Avail: NTIS HC A14/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04B

The mean temperature field at various pressure levels for January and July for both hemispheres are given. In summer (July in the Northern Hemisphere, January in the Southern Hemisphere) the fields are nearly zonally symmetric, but in winter large longitudinal variations are evident. These are mainly of low wave number, i.e., they may be represented by Fourier analysis around the globe using just a few (one or two) waves. This is the basis for representing the climatology of longitudinal variation in terms of wave components, since the fields may be defined with fewer values than by using a grid in longitude that has a sufficiently small interval to adequately represent the smooth variations. The amplitude and phase of temperature and geopotential height for wave numbers one and two, with ln(pressure) as the vertical coordinate are given. The fields were calculated and plotted at pressure intervals of 0.2 in ln(pressure) and at latitude intervals of 4 deg, but were interpolated to intervals of 0.5 in ln(pressure) (approximately 3.5 km) and 10 deg latitude for tabulation. Tables and figures give wave coefficients for the monthly mean temperature fields. Thus they represent the quasi-statinary planetary waves. Author

N86-12821*# Freie Univ., Berlin (West Germany). Meteorological Inst.

PLANETARY WAVES

K. Labitzke and J. J. Barnett (Oxford Univ.) *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 16 Jul. 1985 p 138-143 refs (For primary document see N86-12814 03-46)

Avail: NTIS HC A14/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04B

The middle atmosphere exhibits variation on a time scale of a few days. Short term variations include travelling waves which are found at all seasons (although those occurring in summer have very small amplitudes). However, stratospheric warming which are connected with a very strong intensification of the planetary waves one or two, have the largest effect. They affect the stratosphere and mesosphere over periods varying between a few days and several months. The magnitude of temperature changes which can occur are shown. At some level (e.g., 50 km) changes exceed 70 K over 15 days from 28 December to 18 January. The sudden warming is such a large phenomenon that it strongly affects individual monthly means, giving larger planetary wave amplitudes than for months without large warmings. However, sudden warmings are part of the climatology, and their mean effect needs to be included, but an average over a small number of years for a given month can possibly be inadequate to obtain a reliable mean. Consequently, the means given here must be treated with caution. During the summer season, planetary wave amplitudes are small (a few K) so the year to year variability will cause little absolute error in the amplitude. Year to year variability of the monthly mean is illustrated. Author

N86-12822*# Kyoto Univ. (Japan). Faculty of Science.

GRAVITY WAVES

I. Hirota *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 16 Jul. 1985 p 144-148 refs (For primary document see N86-12814 03-46)

Avail: NTIS HC A14/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04B

In recent years it has been widely recognized that vertically propagating gravity waves play an important role in the dynamics of the middle atmosphere in partly determining the large scale temperature and wind structure through their energy and momentum transport. In particular, the meridional temperature distribution and the mean wind profile in the upper mesosphere are considered to be largely affected by the turbulence diffusion and friction that gravity waves induce through their breaking. For an understanding of the middle atmosphere circulation, it is therefore very important to know the global distribution and temporal variation of gravity waves in a climatological sense. The results of the statistics for gravity wave activity in the stratosphere and mesosphere are presented as a function of latitude and month, with the aid of meteorological rocket network observations. Author

N86-12823*# National Oceanic and Atmospheric Administration, Boulder, Colo. Aeronomy Lab.

GRAVITY WAVES

T. E. VanZandt *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 16 Jul. 1985 p 149-156 refs (For primary document see N86-12814 03-46)

Avail: NTIS HC A14/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04B

Atmospheric parameters fluctuate on all scales. In the mesoscale these fluctuations are occasionally sinusoidal so that they can be interpreted as gravity waves. Usually, however, the fluctuations are noise like, so that their cause is not immediately evident. Results of mesoscale observations in the 20 to 120 m altitude range that are suitable for incorporation into a model atmosphere are very limited. In the stratosphere and lower mesosphere observations are sparse and very little data has been summarized into appropriate form. There is much more data in the upper mesosphere and lower thermosphere, but again very little of it has been summarized. The available mesoscale spectra of horizontal wind u versus vertical wave number m in the 20 to 120 km altitude range are shown together with a spectrum from the lower atmosphere for comparison. Further information about these spectra is given. In spite of the large range of altitudes and latitudes, the spectra from the lower atmosphere (NASA, 1971 and DEWAN, 1984) are remarkably similar in both shape and amplitude. The mean slopes of -2.38 for the NASA spectrum and -2.7 for the Dewan spectra are supported by the mean slope of -2.75 found by ROSENBERG et al. (1974). The mesospheric spectrum is too short to establish a shape. Its amplitude is about an order of magnitude larger than the NASA spectrum in the same wave number range. The NASA and Dewan spectra suggest that the mesoscale spectra in the lower atmosphere are insensitive to meteorological conditions. Author

N86-12824*# Boston Univ., Mass. Dept. of Electrical, Computer, and System Engineering.

ATMOSPHERIC TIDES BELOW 80 km

Jeffrey M. Forbes and Gerald V. Groves (Univ. Coll., London) *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 16 Jul. 1985 p 157-163 refs (For primary document see N86-12814 03-46)

(Grant NSF ATM-8113078)

Avail: NTIS HC A14/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04B

Measurements of diurnal and semidiurnal tidal oscillations between about 25 and 80 km are reviewed. At latitudes greater than about 30 deg, S to N wind components are consistently in quadrature with and similar to the W to E components. The tidal structures are interpreted as a superposition of quasi-steady higher order modes excited in the troposphere by sources of limited extent (approx. 1,000 km). At latitudes less than about 30 deg, steady or quasi-steady diurnal and semidiurnal components are not necessarily the dominant components of daily variation. At high latitudes diurnal phases generally show little change with height in comparison with observations at lower latitudes in accord with the latitudinal properties of positive and negative diurnal modes. Author

N86-12825*# Control Data Corp., Minneapolis, Minn.

COMPARISON OF TIME-PERIODIC VARIATIONS IN TEMPERATURE AND WIND FROM METEOROLOGICAL ROCKETS AND SATELLITES

A. D. Belmont *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 16 Jul. 1985 p 164-174 refs (For primary document see N86-12814 03-46)

Avail: NTIS HC A14/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04B

Although the Meteorological Rocket Network operated by or in cooperation with th United States has decreased from fourteen to nine stations in the past five years, there have been many observations accumulated in the ten years since CIRA 1972 was prepared with data up to 1969. The mean, annual and semiannual variations of temperature and wind are presented and special attention is directed to the polar semiannual wave. The results are compared with the Oxford SCR-PMR five year data set, the CDC-SCR seven year data, and CIRA 1972 with respect to both temperature and zonal winds, as far as presently available. The agreement among the data sets is very good. Author

N86-12826*# Oxford Univ. (England). Dept. of Atmospheric Physics.

ANNUAL AND SEMIANNUAL CYCLES BASED ON THE MIDDLE ATMOSPHERE REFERENCE MODEL

J. J. Barnett, M. Corney, and K. Labitzke (Freie Univ.) *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 16 Jul. 1985 p 175-180 ref (For primary document see N86-12814 03-46)

Avail: NTIS HC A14/MF A01; also available from SCOSTEP

Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04B

The SCR/PMR monthly temperature mean values were Fourier analysed at each latitude and pressure level to obtain the annual mean and the amplitude and phase of the annual and semiannual cycles. The phase is the month of the maximum, such that 1 = January 1, 1.5 = January 16, 2 = February 1, etc. Some very marked hemispheric differences noted are: (1) at 80 N there is a maximum amplitude of the annual cycle of 26 K at 2.5 mb, the corresponding maximum at 80 S is much stronger (35 K) and at a lower altitude (11 mb); (2) the semiannual amplitudes show the well known maximum over the tropics in the upper stratosphere, but also maxima at high latitudes; and (3) the annual mean shows a minimum at 50 S, 1 mb, and a corresponding weaker minimum at 60 N. In general, the hemispheres are remarkably similar and six months out of phase above about 0.3 mb (56 km). The two hemispheres are significantly different especially in winter after allowing for a six month shift. Changes rom summer to winter are so large by comparison that the annual cycles appear to be very similar. Author

N86-12827*# Freie Univ., Berlin (West Germany). Meteorological Inst.

ON THE INTERANNUAL VARIABILITY AND ON TRENDS OF THE TEMPERATURE IN THE MIDDLE ATMOSPHERE

K. Labitzke and B. Naujokat *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 16 Jul. 1985 p 183-196 refs (For primary document see N86-12814 03-46)

Avail: NTIS HC A14/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04B

The new Reference Atmosphere presented here is based on global satellite data and forms a very useful basis for climatological studies. When using such climatologies it is important to be aware of the well known interannual variability which n themiddle atmosphere is particularly large during the northern winters and southern springs. Variability ofthe upper and lower stratospheres is discussed in detail. Areas covered included the polar region and the middile and lower latitudes. Temperature trends, notably the alteration of the global temperature structure by a number of anthropogenically influenced tract gases or the greenhouse effect is discussed. E.R.

N86-12828*# Indian Inst. of Science, Bangalore. Dept. of Aerospace Engineering.

A PROPOSED INTERNATIONAL TROPICAL REFERENCE ATMOSPHERE UP TO 80 km

M. R. Ananthasayanam and R. Narasimha *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 16 Jul. 1985 p 197-204 refs (For primary document see N86-12814 03-46)

Avail: NTIS HC A14/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04B

Based upon previous standard reference atmosphere, which are usually inspired by temperature regions, a proposal is made for an International Tropical Reference Atmosphere (ITRA). It is a modification of the Indian Standard Tropical Atmosphere (ISIA). The data at the available longitudinal stations in the tropics was considered in formulating the present proposal. Balloonsonde, rocketsonde, and grenade and falling sphere data was used in developing the temperature data bse fromt he stratosphere, troposphere and mesosphere. Temperature distribution and mean sea level pressures up to 80 km altitudes is discussed. E.R.

N86-12829*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

INTERIM REFERENCE OZONE MODELS FOR THE MIDDLE ATMOSPHERE

G. M. Keating and D. F. Young (System and Applied Science Corp., Hampton, Va.) *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 16 Jul. 1985 p 205-229 refs (For primary document see N86-12814 03-46)

Avail: NTIS HC A14/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04A

A set of models was generated based on six satellite experiments of the monthly latitudinal variations in total column ozone and the vertical structure of ozone from 20 mb to 0.003 mb. Generally, interannual variability in monthly zonal means is only a few percent. Comparisons of measurements using various techniques to measure global ozone reveal very good agreement between the techniques. Agreement between individual satellite experiments and the reference model of monthly zonal means is generally within 10% below altitudes of 0.4 mb. This has allowed the first global model of ozone measurements to be constructed from multiple sets of satellite measurements. The ozone measurements based on the satellite data are in excellent agreement with previous midlatitude mean annual model based on rocket and balloon data. Also, models are provided of the relation between total ozone and vertical structure. Author

N86-12830*# Boston Univ., Mass. Dept. of Electrical, Computer, and Systems Engineering.

TEMPERATURE STRUCTURE OF THE 80 km TO 120 km REGION

Jeffrey M. Forbes *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 16 Jul. 1985 p 231-238 refs (For primary document see N86-12814 03-46)

Avail: NTIS HC A14/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04B

Between 80 and 120 km the CIRA 1972 model is based heavily on NASA Meteorological Sounding Rocket Program (MSRP) data collected prior to 1967. Since about 1970 an abundance of E-region (100-130 km) temperature data from the incoherent scatter facilities at Arecibo, Millstone Hill, and St. Santin have also become available. The present study examines the temperature structure of the 80 to 120 km region given considerable additional MSRP rocket data, thus providing better seasonal, latitudinal, and longitudinal coverage in the 80 to 100 km region, and a combination of incoherent scatter and rocket data in the 100 to 120 km region which allows a much improved delineation of lower thermosphere temperature structue. Although some individual station comparisons indicate measurable asymmetries in longitude and latitude, data are still insufficient to separate these effects. Specific recommendations of the new CIRA are given. Author

N86-12831*# Saskatchewan Univ., Saskatoon. Inst. of Space and Atmospheric Studies.

MEAN WINDS OF THE UPPER MIDDLE ATMOSPHERE (60-110 km): A GLOBAL DISTRIBUTION FROM RADAR SYSTEMS (MF, METEOR, VHF)

A. H. Manson, C. E. Meek, M. Massebeuf (CNRS), J. L. Fellous (CNRS), W. G. Elford (Adelaide Univ.), R. A. Vincent (Adelaide Univ.), R. L. Craig (Adelaide Univ.), R. G. Roper (Georgia Inst. of Tech.), S. Avery (NOAA, Boulder, Colo.), B. B. Balsley (NOAA, Boulder, Colo.) et al *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 16 Jul. 1985 p 239-268 refs (For primary document see N86-12814 03-46)

Avail: NTIS HC A14/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04B

During the last decade a large number of radars have been developed, which have produced substantial quantities of tidally corrected mean winds data in the upper middle atmosphere. The distribution of the radars is not global, but many areas are well covered. Zonal and meridional wind height-time cross sections from 60 to 80 km (MF/meteor radar) to approx. 110 km were preared for the last 5 to 6 years. They are compared with cross sections from CIRA 1972 for zonal winds, and GROVES (1969) for meridional winds. It is shown that while CIRA 1972 is still a

useful model for many purposes, significant differences exist between it and the new radar data. The latter demonstrate important seasonal, latitudinal, longitudinal and hemispheric variations. The new meridional cross sections are of great value. The common features with GROVES (1969) are the equatorward cells in summer near 85 km; however, their strength (approx. 10 m/s) and size are less. Systematic and somewhat different variations emerge at (higher > 52 N) and lower (35 to 44 deg) latitudes. Author

N86-12832*# Adelaide Univ. (Australia). Dept. of Physics.
PLANETARY AND GRAVITY WAVES IN THE MESOSPHERE AND LOWER THERMOSPHERE
R. A. Vincent *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 16 Jul. 1985 p 269-277 refs (For primary document see N86-12814 03-46)
Avail: NTIS HC A14/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04B

Rocket and ground based studies of the mesosphere and lower thermosphere show that waves play an important role in the dynamics of their region. The waves manifest themselves in wind, temperature, density, pressure, ionization and airglow fluctuations in the 80-120 km height range. Rockets have enabled the density and temperature structure to be measured with excellent height resolution, while long term studies of wind motions using MST, partial reflection and meteor radars and, more recently, lidar investigations of temperature and density, have enabled the temporal behaviour of the waves to be better understood. A composite of power spectra is shown of wind motions measured near the mesopause at widely separated locations and illustrates how wave energy is distributed as a function of frequency. The spectra show three distinct parts; (1) a long period section corresponding to periods longer than 24 h; (2) a section between 12 and 24 h priod where the spectra are dominated by narrow; peaks associated with the semidiurnal and diurnal tides and (3) a section at periods less than 12 h where the spectral density decreases monitonically (except for the 8 h tidal peak). The long period section is associated with transient planetary scale waves while the short period motions are caused by gravity waves.
Author

N86-12833*# Boston Univ., Mass. Dept. of Electrical, Computer, and Systems Engineering.
ATMOSPHERIC TIDES BETWEEN 80 km AND 120 km
Jeffrey M. Forbes *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 16 Jul. 1985 p 278-289 refs (For primary document see N86-12814 03-46)
(Grant NSF ATM-81-13078)
Avail: NTIS HC A14/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04B

The structure and variability of tides in the 80 to 120 km height region are reviewed. Particulary emphasized are seasonal-latitudinal variations in the vertical structure of diurnal and semidiurnal winds between 70 to 110 km as measured by meteor and partial reflection drift radars, and tidal temperatures determined by incoherent scatter radars between 100 and 140 km. Variations in tidal structures with longitude, from day to day, and during equinoctial transition periods are also addressed. A brief summary of the current status of atmospheric tidal modelling is provided.
Author

N86-12834*# Adelaide Univ. (Australia). Dept. of Physics.
TURBULENCE IN THE ALTITUDE REGION 80-120 km
W. K. Hocking *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 16 Jul. 1985 p 290-304 refs (For primary document see N86-12814 03-46)
Avail: NTIS HC A14/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04B

Measurements of turbulent energy dissipation rates and eddy diffusion coefficients have been collated, and mean height profiles of fundamental turbulence parameters in the region 80 to 120 km are presented. Curves of Epsilon, and K vs. height are presented. A clear global and seasonal picture of turbulence variations is not yet apparent.
Author

N86-12835*# Centre National de la Recherche Scientifique, Verrieres-Le Buisson (France). Service d'Aeronomie.
CONTRIBUTION TO THE CIRA MODEL FROM GROUND-BASED LIDAR
M. l. Chanin, A. Hauchecorne, and N. Smires *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 16 Jul. 1985 p 305-314 refs (For primary document see N86-12814 03-46)
Avail: NTIS HC A14/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04B

A new technique, the Rayleigh-Lidar Sounding, has been developed recently to probe the Middle Atmosphere and has demonstrated its ability to provide density and temperature profiles in the height range 30 to 90 km. It has been limited until now to ground-based observations. The set of data, as it exists to-day, has been obtained from a unique midlatitude site. Even with this limiting factor, it is thought to be a useful complement to a global model, mainly because of its spatial and temporal resolutions, usually not available from global data. Such resolutions give an insight into the atmospheric variability as a function of height and time, for time-scale ranging from minutes to years. The process is briefly described. A description of the analysis and its results is given.
Author

N86-12836*# National Oceanic and Atmospheric Administration, Boulder, Colo. Aeronomy Lab.
THE MST RADAR TECHNIQUE
Ben B. Balsley *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 16 Jul. 1985 p 315-318 refs (For primary document see N86-12814 03-46)
Avail: NTIS HC A14/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04B

The past ten year have witnessed the development of a new radar technique to examine the structure and dynamics of the atmosphere between roughly 1 to 100 km on a continuous basis. The technique is known as the MST (for Mesosphere-Stratosphere-Troposphere) technique and is usable in all weather conditions, being unaffected by precipitation or cloud cover. MST radars make use of scattering from small scale structure in the atmospheric refractive index, with scales of the order of one-half the radar wavelength. Pertinent scale sizes for middle atmospheric studies typically range between a fraction of a meter and a few meters. The structure itself arises primarily from atmospheric turbulence. The technique is briefly described along with the meteorological parameters it measures.
Author

N86-12837*# International Council of Scientific Unions, Urbana, Ill.
MIDDLE ATMOSPHERE PROGRAM. HANDBOOK FOR MAP, VOLUME 17
C. F. Sechrist, Jr., ed. Aug. 1985 150 p refs Sponsored in part by UNESCO
(NASA Order W-15897)
(NASA-CR-176345; NAS 1.26:176345; MAP-HANDBOOK-17)
Avail: NTIS HC A07/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04A

The Middle Atmosphere Program (MAP) handbook is divided into three parts. Part 1 consists of minutes of MAP steering committee meeting and MAP assembly. Part 2 consists of project and study group reports, such as: (1) Atmospheric Tides Middle Atmosphere Program (ATMAP), report of the Nov./Dec. 1981, and May 1982 observational campaigns; MAP/WINE experimenters meeting at Berlin, 1985; (3) MAP/WINE experimenters meeting at Loen, Norway, 1985; and (4) the penetration of ultraviolet solar

radiation into the middle atmosphere. Part 3 consists of national reports. For individual titles, see N86-12838 through N86-12851.

N86-12838*# Max-Planck-Inst. fuer Aeronomie, Katlenburg-Lindau (West Germany).
TOWARDS A GLOBAL MAP DATA BASE
G. K. Hartmann *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 17 Aug. 1985 p 26-35 refs Sponsored in part by the Deutsche Forschungsgemeinschaft (For primary document see N86-12837 03-46)
Avail: NTIS HC A07/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04A

Scientific and ecological needs call for the generation of a global data base of measured data from the Earth's atmosphere, similar but complementary to the data of the meteorological service. Right now there is a large gap between these needs and the available financial means. If this prevails, it might be prohibitive for the generation of such a data base. There must be a compromise between the needs and the means. Priorities must be set. Thus, discussions should be started on which data can be or should be stored. Newly generated data for storage in such a data base is recommended to be handled by the World Data Centers (WDCs). This brief report should help to stimulate discussions and ubsequent actions. Author

N86-12839*# Boston Univ., Mass.
ATMOSPHERIC TIDES MIDDLE ATMOSPHERE PROGRAM (ATMAP): REPORT OF THE NOVEMBER/DECEMBER 1981, AND MAY 1982, OBSERVATIONAL CAMPAIGNS
Jeffrey M. Forbes *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 17 Aug. 1985 p 36-43 refs (For primary document see N86-12837 03-46) (Grant NSF ATM-83-19487)
Avail: NTIS HC A07/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04A

Atmospheric tides, oscillations in meteorological fields occurring at subharmonics of a solar or lunar day, comprise a major component of middle atmosphere global dynamics. The nature of atmospheric tides requires investigations and coordination on a global, and hence international, scale. The purpose of ATMAP is to create an interaction among observationalists, data analysts, theoreticians and modellers working towards common goals. The focus for this interaction is a series of global observational campaigns involving ground based remote sensing methods. The calendar of activities for ATMAP is presented. The results of solstice campaigns I and II are assembled, a preliminary interpretation of the results is presented. Author

N86-12840*# Colspan, Inc., Boulder, Colo. Cooperative Inst. for Research in Environment Science.
DATA DESCRIPTIONS AND VERTICAL STRUCTURE PLOTS FOR MEAN, DIURNAL, AND SEMIDURNAL COMPONENTS OF EASTWARD AND NORTHWARD (ORDERED BY LATITUDE). MEAN WINDS AND TIDES OVER POKER FLAT, ALASKA (65 DEG N, 147 DEG W), DURING NOVEMBER 1981 Abstract Only
S. K. Avery *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 17 Aug. 1985 p 44-45 ref (For primary document see N86-12837 03-46)
Avail: NTIS HC A07/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04A

The mean zonal and meridional winds and the amplitude and phase structures for the tidal harmonics for the month of November, 1981 are given. The mean winds are weak westerlies and weak southerlies. The westerlies are approximately 10 ms (-1) lower than those during November 1980 and 1982. The diurnal amplitudes are small in both the zonal and meridional wind components. The diurnal phase structures are characteristic of a propagating wave having a ertical wavelength of approximately 50 km. The semidiurnal tidal harmonic amplitudes are slightly larger than the diurnal amplitudes. However, the phase structures are different for the zonal and meridional components. The meridional phase structure appears evanescent. The zonal phase structure has a phase reversal at 88 km with downward phase progression below that level and upward phase progression above that level. The vertical wavelength is roximately 12 km. This short vertical wavelength occurs during other months of the year but longer wavelengths are more common. Author

N86-12841*# Academy of Sciences, Berlin (East Germany). Central Inst. of Solar Terrestrial Physics.
RESULTS OF THE MAY 1982 ATMAP CAMPAIGN AT THE METEOR WIND STATION KUEHLUNGSBORN (54 DEG N, 12 DEG E), GDR Abstract Only
K. M. Greisiger *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 17 Aug. 1985 p 46 (For primary document see N86-12837 03-46)
Avail: NTIS HC A07/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04A

A sinusoisal least squares fit over the entire data of 1 to 6 May 1982 was computed. The results are shown. Wind results refere to an average height of 95 km (no height determination). The wind results correspond, in general, to the average behavior of early May. The zonal prevailing west wind, however, is stronger than the term mean value (-5 m/s). Also, the amplitude of the semidiurnal idal wind is larger (mean value 1977 to 1983: 8 m/s). Author

N86-12842*# Geophysical Observatory, Collm (East Germany).
REMARKS ON THE ATMAP CAMPAIGNS IN NOVEMBER 1981 AND MAY 1982 AT COLLM (52 DEG N, 15 DEG E) Abstract Only
R. Schminder *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 17 Aug. 1985 p 47-50 (For primary document see N86-12837 03-46)
Avail: NTIS HC A07/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04A

The results given are based on daily nighttime L. F. wind measurements over Central Europe on three measuring paths at 179, 227, and 272 kHz. Absolute reflection height measurements were carried out for the first time in August 1982 so that values of the months of 1982 and 1983 have been taken for the campaigns in November 1981 and May 1982. The prevailing wind and the semidiurnal tidal wind components are calculated daily. Means of the month or means of parts of a month are formed for climatological investigations. A 24 hour analysis is not possible due to the very different reflection heights during the daytime and nighttime, even with measurements being carried out the whole ay long in the winter season. The critical examination of the choice of the measuring intervals selected is dependent on the visual angle. A wind ield change is observed over Central Europe very often around the 20th of November 1981 this wind field variation being in the core period and leading over to a more stable tidal wind. Author

N86-12843*# Saskatchewan Univ., Saskatoon. Inst. of Space and Atmospheric Studies.
SASKATOON M. F. RADAR SYSTEM: (52 DEG N, 107 DEG W), CANADA Abstract Only **c45**
A. H. Manson and C. E. Meek *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 17 Aug. 1985 p 52-56 refs (For primary document see N86-12837 03-46)
Avail: NTIS HC A07/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04A

The system runs continuously, producing 1-h profiles approx. 75 to 110 km, 1978 to 1983: in particular for the 30-d (Nov. 9 to Dec. 7), 10-d (Nov. 16 to 26), 4-d core periods (Nov. 19 to 23). The means (EW, NS) and fourier components (24-, 12-h) fitted for the 4-d are shown. s.d. are shown, as derived from four 24-h fits in the interval. Comparisons with the 10-, 30-d intervals confirm

confidence in these data and the lack of major variability in November. The 1-h profiles are means of < 12 profiles so intrinsic errors are minimal. The 4-, 10-d fourier fits are compared and also the 30-d means from 48-h fits; in these amplitudes are N2+E2 as N/E approx. 1. Means differ slightly due to planetary wave activity; 24-h tides are variable in Novembers; and the 12-h variation is small less than 80 km. The final figure is a high resolution spectra for the November month: the 12-, 24-h dominate; the 8-h appears less than 100 km; and up to 90 km there is a 4-d oscillation. Author

N86-12844*# Saskatchewan Univ., Saskatoon. Inst. of Space and Atmospheric Studies.

MAY 1982, SASKATOON M. F. RADAR SYSTEM: (52 DEG N, 107 DEG W), CANADA Abstract Only

A. H. Manson and C. E. Meek *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 17 Aug. 1985 p 57-59 refs (For primary document see N86-12837 03-46)

Avail: NTIS HC A07/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04A

The system runs continuously, producing 1-h profiles approx. 75 to 110 km, 1978 to 1983: in particular for the 30-d (April 20 to May 19) centered on the inner core (May 3 to 6), 10-d (May 2 to 11). Incredibly, the only days missed for April/May were May 4/5, so 4-d fits for the core could not made! However the winds and tides were stable during May, so that the 10-d fits can be taken for comparison with other locations. The means (EW/NS) and Fourier components (24-, 12-h) for the 10-d (May 2 to 11) are shown; also those for the 30 days. Standard deviations are shown to be quite small. There is also little difference between 10- and 30-d profiles. The zonal flow is quite weak, showing that the summer westward flow has not fully developed. The 24-h tide has large lambda: approx. 100 km (EW and infinity (NS). Below 90 km the tide is circular, but above almost linear with EW amplitudes larger than NS. The 12-h tide is circular and lambda is small below 95 km; and more linear and variable above. The 30-d May spectral figure shows that 12-, 24-h tides are comparable; otherwise there is a 3.85-d oscillation to approx. 90 km; there were no other significant peaks. Author

N86-12845*# New Hampshire Univ., Durham.

METEOR WIND RESULTS AT DURHAM (43 DEG N, 71 DEG W) DURING THE ATMAP NOVEMBER 1981 AND MAY 1982 CAMPAIGNS Abstract Only

Ronald R. Clark *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 17 Aug. 1985 p 60-62 ref (For primary document see N86-12837 03-46)

Avail: NTIS HC A07/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04A

Winds modeled from data measured with the University of New Hampshire Meteor Wind Radar System at Durham, New Hampshire, over the two 4-day periods November 20 to 23, 1981 and May 8 to 11, 1982 are presented. The raw meteor wind data was fit in a least square sense to a three dimensional model containing mean, 12-, 24-, and 48-h periods. The means winds for both periods are very close to the three year average values at Durham during May and November, respectively. The semidiurnal component for the November period had a normal amplitude and phase, and an estimated veritcal wavelength of 60 km. The May period results were essentially typical except that the Northward amplitude was 3 to 4 times smaller than normal. The diurnal amplitudes measured for both periods are typical for Durham and the diurnal phase is normally not very consistent. The 48-hour component amplitude is typical for these months. The intrinsic errors fo the radar are approximately + or - 2 km in position and + or - 4 m/s in radial velocity including quantization errors. These errors are random with zero mean and should not bias the wind results. Author

N86-12846*# Illinois Univ., Urbana. Aeronomy Lab.

MEAN WINDS AND TIDES OVER URBANA, ILLINOIS DURING NOVEMBER 16-22, 1981 Abstract Only

D. Tetenbaum *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 17 Aug. 1985 p 63-64 ref (For primary document see N86-12837 03-46)

Avail: NTIS HC A07/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04A

The Urbana Meteor Radar uses a high power pulse transmitter to achieve high echo rates, and an interferometer to spatially locate the individual echoes. The irregularly spaced observations of range, radial velocity, and direction cosines are reduced to a rectangular grid, evenly spaced in time and height, of estimates of the zonal and meridional wind. This is accomplished using the method of GROVES whereby a constant horizontal wind is fitted, using least squares, to all echoes occurring within a fixed time/height interval. This interpolation region is then stepped in time and height. the size of the interpolation region is 2 hours by 5 km, the time step is approximately 11 minutes, and the height step is 2 km. The filtering of high temporal and spatial frequencies is somewhat reduced by weighting the echoes according to their distance from the center of the interpolation box. Author

N86-12847*# Kyoto Univ. (Japan). Radio Atmospheric Science Center.

KYOTO METEOR RADAR OBSERVATION IN NOVEMBER, 1981 AND MAY, 1982 Abstract Only

Toshitaka Tsuda and Susumu kato *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 17 Aug. 1985 p 65-69 refs (For primary document see N86-12837 03-46)

Avail: NTIS HC A07/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04A

The Kyoto meteor radar a pulsed Doppler radar and operates at 31.57 MHz ith peak power of 10 kW. An interferometer is adopted for arrival angle measurement. Height resolution is approximately 1 to 3 km depending on both azimuth and elevation angles. Data is analyzed according to an algorithm approved by GROVES. All data in height range 84 to 104 km are separated into five layers, whose altitude width is 4 km. In each layer, least square fitting is performed for ten parameters, which are amplitudes of northward/eastward mean wind and sin/cos component of diurnal/semidiurnal tide. Reliable range for each parameter is also calculated. Author

N86-12848*# EISCAT Scientific Association, Kiruna (Sweden).

MESOSPHERIC WINDS AND TIDES AT ARECIBO/PUERTO RICO (18 DEG N, 67 DEG W) NOVEMBER 20-23, 1981 Abstract Only

J. Rottger *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 17 Aug. 1985 p 70-71 ref (For primary document see N86-12837 03-46)

Avail: NTIS HC A07/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04A

The SOUSY-VHF-Radar was operated in the period November 20 to 23, 1981 during a continuous run at the Arecibo Observatory. The data used for this analysis were recorded from 06 AST on November 20 until 06 AST on November 23. Meridional winds were measured at odd hours and zonal winds at even hours. The occurrence of mesospheric VHF radar echoes was limited as usual to the daylight hours between 06 and 18 AST. The height limits, were variable from day to day, they were roughly 62 to 90 km. The intermittency of echoes in time and height, as well as radio interference, made it fairly difficult to deduce tidal information for this time period. About 10 to 45 single velocity estimates could be used to calculate an hourly mean. The variance of the displayed resulting in data, obtained by weighted averaging over the 3 day period, is about similar to the mean. The winds were extremely low during the observation period. Velocities of the prevailing wind, observed during an earlier campaign were 5 to 10 times larger

than in the period of November 20 to 23, 1981. The amplitudes of the diurnal tide are comparable. Author

N86-12849*# Kyoto Univ. (Japan). Dept. of Electrical Engineering.

MESOSPHERIC WINDS AT JICAMARACA, PERU (12 DEG S, 77 DEG SW), NOVEMBER 19-21, 1981 Abstract Only

T. Aso, Y. Maekawa, I. Hirota (Inst. Geofisico del Peru, Lima), R. F. Woodman, and S. Kato *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 17 Aug. 1985 p 72-74 refs (For primary document see N86-12837 03-46)

Avail: NTIS HC A07/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04A

The altitude of mean zonal wind in the mesosphere during the whole daytime observations is given. Positive value refers to eastward. At around 70 km, wind corresponds to summer easterly, and changes to westerly with increasing altitude above about 77 km. These are fairly compatible with known features of zonal wind at this latitude. Contour plot shows local time variations of zonal wind with daytime mean subtracted and averaged over three days. Shaded area designated westward wind with contour level of 2 m/s. The daily variation is almost in phase with altitude in the 65 to 80 km region. Thus the semidiurnal tide with long vertical wavelength is inferred to exist. Above 80 km, phase tilt occurs which indicates the contribution of the propagating diurnal component. Here the combination of dc and 12-hr component is fitted to the data below 80 km. The altitude profiles of the amplitude and phase of this semidiurnal component are shown. Author

N86-12850*# Adelaide Univ. (Australia). Dept. of Physics.

RESULTS OF NOVEMBER 1981 AND MAY 1982 ATMAP CAMPAIGNS AT ADELAIDE (35 DEG S, 138 DEG E) Abstract Only

R. A. Vincent *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 17 Aug. 1985 p 75-78 ref (For primary document see N86-12837 03-46)

Avail: NTIS HC A07/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04A

The mean zonal circulation for both the November and May campaigns are representative of early summer and winter conditions. The mean meridional flow in November was stable and typical of summer conditions at Adelaide. The conditions in May were, however, more variable and appeared to be changing significantly during the campaign. It is possible that there was a strong influence from a large scale wave which could account for the large meridional wind values observed. Overall, the mean tidal structures observed during the core periods were not significantly different from those observed in two-week intervals centered on the cores. In May both components show evidence for propagating components with 30 to 40 km vertical wavelengths. For the semidiurnal components, the phase structures show evidence for vertical propagation with apparent vertical wavelengths of the order of 50 km. The mean amplitudes for the semidiurnal components in May are close to the noise level. Typical errors from the harmonic analysis are + or - 1 to 2 ms(-1) in amplitude and + or - 0.5 hr in phase, but these are probably underestimates. Author

N86-12851*# Canterbury Univ., Christchurch (New Zealand). Dept. of Physics.

MIDDLE ATMOSPHERE TIDES AT CHRISTCHURCH (44 DEG S, 17 DEG E) IN NOVEMBER 1981 AND MAY 1982 Abstract Only

G. J. Fraser *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 17 Aug. 1985 p 79-81 (For primary document see N86-12837 03-46)

Avail: NTIS HC A07/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04A

Atmospheric tides at Christchurch were measured at heights of 80 to 100 km, in 2.5 km intervals during the ATMAP campaigns of November 1981 and May 1982. Average components for the 5-day periods, November 19 to 23 and May 3 to 7, were extracted by making an equally weighted least squares fit to the hourly mean values, using the sum of mean, diurnal and semidiurnal terms. Estimates of standard deviation from the least squares fit tend to be less than the variability between successive 5-day samples, but 5 to 8 ms(-1) and 2 to 3 h are typical. At altitudes below 83 km there may be gaps of up to 6 hours during the night which may generate a systematic error in the components. Amplitude and phase characteristics are generally consistent with November 1980 and 1982 and May 1981, although the amplitude of the diurnal EW tide was low in November 1981, with consequent large phase fluctuations. Author

N86-12852*# National Aeronautics and Space Administration, Washington, D. C.

GEOPOTENTIAL RESEARCH MISSION (GRM)

Oct. 1985 141 p refs Conf. held in College Park, Md., 29-31 Oct. 1984

(NASA-CP-2390; NAS 1.55:2390) Avail: NTIS HC A07/MF A01 CSCL 08E

The Geopotential Research Mission (GRM) is a satellite system proposed to determine variations in the gravitational and magnetic fields to a resolution of about 100 kilometers. Knowledge and interpretations of the potential fields on scales of 100 kilometers and greater, to clarify the needs for better data in this range of wavelengths were reviewed. The potential contribution of these data to the determination, by satellite altimetry, of a more accurate geoidal reference was discussed. For individual titles, see N86-12853 through N86-12895.

N86-12853*# Massachusetts Inst. of Tech., Cambridge. Dept. of Earth, Atmospheric and Planetary Sciences.

IMPACT OF GRM: NEW EVIDENCE FROM THE SOVIET UNION

Marcia McNutt *In* NASA, Washington Geopotential Res. Mission (GRM) Oct. 1985 p 8-9 refs (For primary document see N86-12852 03-46)

Avail: NTIS HC A07/MF A01 CSCL 08G

Gravity information released by the Soviet Union allows the quantitative assessment of how the geopotential research mission (GRM) mission might effect the ability to use global gravity data for continental tectonic interpretation. The information is of an isostatic response spectra for eight individual tectonic units in the USSR. The regions examined include the Caroathians, Caucasus, Urals, Pamirs, Tien-Shan, Altal, Chersky Ridge, and East Siberian Platform. The 1 deg x 1 deg gravity data are used to calculate the admittances are used in two different sorts of tectonic studies of mountain belts in the USSR: (1) interpretation of isostatic responses in terms of plate models of compensation for mountainous terrain. Using geologic information concerning time of the orogeny, lithospheric plates involved, and polarity of subduction in collision zones, they convert the best-fitting flexural rigidity to an elastic plate thickness for the lithospheric plate inferred to underlie the mountains; the isostatic admittance functions is an attempt to directly model gravity and topography data for a few select regions in the Soviet Union. By knowing the value of the expected correlation between topography and gravity from the admittances, the Artemjev's map in mountainous areas can be calibrated, and the maps are converted back to Bouguer gravity. This procedure is applied to the Caucasus and southern Urals. E.A.K.

N86-12854*# Eidgenoessische Technische Hochschule, Zurich (Switzerland). Inst. fuer Geodasie und Photogrammetrie.

DYNAMICS AND STRUCTURE OF THE ALPINE FOLD BELT Abstract Only

H.-G. Kahle *In* NASA, Washington Geopotential Res. Mission (GRM) Oct. 1985 p 10 (For primary document see N86-12852 03-46)

Avail: NTIS HC A07/MF A01 CSCL 08G

The structure and present-day dynamics of the Alps interms of geodesy and gravimetry are discusssed. A strong correlation of precise leveling and isostatic gravity along the central Alpine

chain, especially in Canton Graubunden, East Switzerland are shown. It is assumed that the uplift is partly controlled by isostatic rebound effects. Field observations indicate that these phenomena are still active in the Alps. The study of the uplift processes by applying a number of geodetic and gravimetric measuring techniques, such as the determination of nonperiodic secular variations of gravity, of the deflections of the vertical and tilt changes monitored by hydrostatic leveling is proposed. E.A.K.

N86-12855*# Australian National Univ., Canberra. Research School for Earth Sciences.
WHY DO WE NEED DETAILED GRAVITY OVER CONTINENTS: SOME AUSTRALIAN EXAMPLES
Kurt Lambeck *In* NASA, Washington Geopotential Res. Mission (GRM) Oct. 1985 p 11 (For primary document see N86-12852 03-46)
Avail: NTIS HC A07/MF A01 CSCL 08G

Geophysical quantities available over a continent are gravity and components of the magnetic field. Direct inferences on crustal structure are difficult to make and strongly dependent on mechanical assumptions the isostatic state. The data for Australia represents one of the best continental scale gravity surveys. The gravity anomalies are generally bland over the continent which confirms that stress relaxation and erosion and rebound were instrumental in reducing nonhydrostatic stresses. In central Australia very large gravity anomalies occur and the region is out of isostatic equilibrium despite the fact that tectonic activity ceased 300 ma ago. The isostatic response functions points to a substantial horizontal compression in the crust. Similar conclusions are drawn for the large anomalies in western Australia. The tectonic implications of these anomalies are examined. In eastern Australia the gravity anomalies are explained in terms of a model of erosion of the highlands and concomitant regional isostatic rebound. E.A.K.

N86-12856*# Pennsylvania State Univ., University Park. Geophysics Program.
A MAJOR CRUSTAL FEATURE IN THE SOUTHEASTERN UNITED STATES INFERRED FROM THE MAGSAT EQUIVALENT SOURCE ANOMALY FIELD
Michal E. Ruder and Shelton S. Alexander *In* NASA, Washington Geopotential Res. Mission (GRM) Oct. 1985 p 2-15 refs (For primary document see N86-12852 03-46)
Avail: NTIS HC A07/MF A01 CSCL 08G

The MAGSAT equivalent-source anomaly field evaluated at 325 km altitude depicts a prominent anomaly centered over southeast Georgia, which is adjacent to the high-amplitude positive Kentucky anomaly. To overcome the satellite resolution constraint in studying this anomaly, conventional geophysical data were included in analysis: Bouguer gravity, seismic reflection and refraction, aeromagnetic, and in-situ stress-strain measurements. This integrated geophysical approach, infers more specifically the nature and extent of the crustal and/or lithospheric source of the Georgia MAGSAT anomaly. Physical properties and tectonic evolution of the area are all important in the interpretation. E.A.K.

N86-12857*# Toronto Univ. (Ontario). Dept. of Geology.
GEOPHYSICAL INTERPRETATION OF THE MAGNETIC ANOMALIES OF THE EARTH DERIVED FROM MAGSAT DATA
J. Arkani-Hamed and D. W. Strangway *In* NASA, Washington Geopotential Res. Mission (GRM) Oct. 1985 p 16-17 (For primary document see N86-12852 03-46)
Avail: NTIS HC A07/MF A01 CSCL 08G

The ambiguities about geophysical implications based on the correlation of scalar magnetic anomalies and geological features were investigated. A method was developed to convert scalar magnetic anomalies into a map of the lateral variations of magnetic susceptibility of the lithosphere. This map is directly correlated with the causative sources. The method is based on spherical harmonic analysis of lateral variations seen on the scalar magnetic anomaly map and those of the lithospheric magnetic susceptibility. The harmonic coefficients are related through the fundamental causality relationship governing a magnetized body and its associated scalar magnetic anomaly. The main features of the resulting magnetic susceptibility anomalies are outlined. E.A.K.

N86-12858*# Southern Methodist Univ., Dallas, Tex. Dept. of Geological Sciences.
SATELLITE MAGNETIC MODELING OF NORTH AFRICAN HOT SPOTS
Roger J. Phillips and Carolyn R. Brown *In* NASA, Washington Geopotential Res. Mission (GRM) Oct. 1985 p 18-21 refs (For primary document see N86-12852 03-46)
Avail: NTIS HC A07/MF A01 CSCL 08G

The primary objectives of the MAGSAT mission was to measure the intensity and direction of magnetization of the Earth's crust. A significant effort was directed to the large crustal anomalies first delineated by the POGO mission. The MAGSAT data are capable of spatial resolution of the crustal field to 250 km wavelength with reliability limits to less than 1 nT in the mean. The difficulties of dealing with less than the most robust of the MAGSAT anomalies is that often there is no more than the magnetic fields themselves to constrain geophysical models of the interior, and no independent means of assessing the quality of the crustal anomaly data in interpreting the subsurface are available. E.A.K.

N86-12859*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
MAGNETIC STRUCTURE OF THE CRUST
Peter Wasilewski *In* NASA, Washington Geopotential Res. Mission (GRM) Oct. 1985 p 22-25 (For primary document see N86-12852 03-46)
Avail: NTIS HC A07/MF A01 CSCL 08G

The bibuniqueness aspect of geophysical interpretation must be constrained by geological insight to limit the range of theoretically possible models. An additional step in depth understanding of the relationship between rock magnetization and geological circumstances on a grand scale is required. Views about crustal structure and the distribution of lithologies suggests a complex situation with lateral and vertical variability at all levels in the crust. Volcanic, plutonic, and metamorphic processes together with each of the observed anomalies. Important questions are addressed: (1) the location of the magnetic bottom; (2) whether the source is a discrete one or are certain parts of the crust cumulatively contributing to the overall magnetization; (3) if the anomaly to some recognizable surface expression is localized, how to arrive at a geologically realistic model incorporating magnetization contrasts which are realistic; (3) in the way the primary mineralogies are altered by metamorphism and the resulting magnetic contracts; (4) the effects of temperature and pressure on magnetization. E.A.K.

N86-12860*# Lamont-Doherty Geological Observatory, Palisades, N. Y.
GRAVITY, GEOID AND THE OCEANIC LITHOSPHERE Abstract Only
A. B. Watts *In* NASA, Washington Geopotential Res. Mission (GRM) Oct. 1985 p 28 (For primary document see N86-12852 03-46)
Avail: NTIS HC A07/MF A01 CSCL 08E

Plate tectonics and its contribution to progress in studies of the Earth's gravitational field is discussed. In acquisition, the development of forced feedback accelerometers, satellite navigation, and satellite radar altimetry significantly improved the accuracy and coverage of gravity data over the oceans. In interpretation, gravity and geoid anomalies are used to determine information on the thermal and mechanical properties of the oceanic lithosphere and the forces that drive plate motions. E.A.K.

N86-12861*# Centre National d'Etudes Spatiales, Toulouse (France).
THERMAL COOLING OF THE OCEANIC LITHOSPHERE FROM GEOID HEIGHT DATA
A. Cazenae *In* NASA, Washington Geopotential Res. Mission (GRM) Oct. 1985 p 29-30 (For primary document see N86-12852 03-46)

Avail: NTIS HC A07/MF A01 CSCL 08E

Another type of geophysical observation has proved to be very useful in the study of thermal cooling of the oceanic lithosphere. It is the geoid height derivative with respect to plate age, a quantity computed from the short wavelength geoid step across fracture zones measured by altimeter satellites. Two categories of simples models are proposed to describe cooling and contraction of the oceanic lithosphere with age. Both plate model and half space model, give almost similar results up to ages of 50 to 70 ma, but predict quite distinct behavior of seafloor depth, heat flow and other parameters in old basins. Tests of thermal models are based on heat flow and topography data. However, heat flow is not very sensitive to the form of the thermal model. Large areas of the ocean floor are particularly shallow, and as a result topography data may not be very appropriate to discriminate between plate and half space models, and no clear concensus on a preferred model yet exists. E.A.K.

N86-12862*# Lamont-Doherty Geological Observatory, Palisades, N. Y.

STUDIES OF THE MARINE CRUSTAL MAGNETIZATION AT INTERMEDIATE WAVELENGTHS Abstract Only

J. L. LaBrecque, S. C. Cande, and C. A. Raymond *In* NASA, Washington Geopotential Res. Mission (GRM) Oct. 1985 p 31 (For primary document see N86-12852 03-46)

Avail: NTIS HC A07/MF A01 CSCL 08N

The data can be filtered at intermediate wavelengths to provde a data set which complements the satellite fields of MAGSAT, TSS and GRM. The filtered marine data set provides a high resolution data set which is closer to the source bodies than satellite survey data. However, the GRM and TSS could provide the necessary resolution to match the filtered sea surface field. The added resolution determines the nature of crustal magnetizations which give rise to the intermediate wavelength field. It is found that remanent magnetization is an important component over the oceans. Crustal deformation and plate motions result in magnetization vectors which differ significantly from the present day field directions. Induced magnetization or GRM are important components over the oceanic plateaus and spreading centers. E.A.K.

N86-12863*# Johns Hopkins Univ., Baltimore, Md. Dept. of Earth and Planetary Sciences.

LITHOSPHERIC STRUCTURE IN THE PACIFIC GEOID

B. D. Marsh and J. H. Hinojosa *In* NASA, Washington Geopotential Res. Mission (GRM) Oct. 1985 p 32-35 (For primary document see N86-12852 03-46)

Avail: NTIS HC A07/MF A01 CSCL 08E

The high degree and order SEASAT geoid in the central Pacific correlates closely with the structure of the cooling lithosphere. Relative changes in plate age across major fracture zones in relatively young seafloor frame the east-west trending pattern formed by the geoid anomalies. The field removal in bathymetry corresponds to removal of some of the low degree and order geoidal components, the step like structure across fracture zones is also removed. The regional thermal subsidence was removed from the bathymetry by subtracting a mean subsidence surface from the observed bathymetry. This produces a residual bathymetry map analogous to the usual residual depth anomaly maps. The residual bathymetry obtained in this way contains shallow depths for young seafloor, and larger depths for older seafloor, thus retaining the structure of the lithosphere while removing the subsidence of the lithosphere. E.A.K.

N86-12864*# National Geodetic Survey, Rockville, Md. Charting and Geodetic Services.

THE GRAVITY FIELD OF TOPOGRAPHY BURIED BY SEDIMENTS Abstract Only

David T. Sandwell and Char-Shine Liu (California Univ., San Diego, La Jolla) *In* NASA, Washington Geopotential Res. Mission (GRM) Oct. 1985 p 36 (For primary document see N86-12852 03-46)

Avail: NTIS HC A07/MF A01 CSCL 08G

The gravity field over topography in the northern Indian Ocean that was completely buried by sediments of the Bengal Fan was investigated to understand the effect of sedimentation on the continental gravity field. An isopach map made from the seismic reflection and refraction in the Bay of Bengal shows two prominent N-S trending features in the basement topography. The northernmost portion of the Ninetyeast Ridge is totally buried by sediments north of 10 deg N. The other buried ridge trends roughly N-S for 1400 km at 85 deg E to the latitude of Sri Lanka and then curves toward the west. It has basement relief up to 6 km. Two free air gravity anomaly profiles across the region show a strong gravity low over the 85 deg E ridge, while the Ninetyeast Ridge shows a gravity high. E.A.K.

N86-12865*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

GRM CRUSTAL MAGNETIC ANOMALIES: SEPARATING THE LORD HOWE RISE AND NORFOLK RIDGE SUBMARINE STRUCTURES

Herbert Frey *In* NASA, Washington Geopotential Res. Mission (GRM) Oct. 1985 p 37-40 (For primary document see N86-12852 03-46)

Avail: NTIS HC A07/MF A01 CSCL 08G

Multiple source bodies often lie within the resolution element of the MAGSAT and POGO data. Small weak sources lying near larger stronger sources will tend to be missed, although they do contribute to the total observed anomaly. Lower elevation magnetic anomaly surveys such as GRM alleviate this problem through the combined effects of significantly greater resolution and stronger signal amplitude. This permits the detection of smaller source bodies, and analysis of their structure and nature. The improvement a GRM will provide is demonstrated in the Lord Howe Rise/Norfolk Ridge area east of Australia, between the Tasman Sea and south Fiji Basin. The submarine features origin have important plate tectonic implications. The Lord Howe Rise (LHR) is a continental fragment broken off from Australia by the opening of the Tasman Sea. It is a wide, shallow structure lying between 160 and 165 deg longitude at 23 to 37 deg S latitude. Seismic refraction data show the LHR crust extending to depths in excess of 20 km. E.A.K.

N86-12866*# Johns Hopkins Univ., Baltimore, Md. Dept. of Earth and Planetary Sciences.

SEA FLOOR SWELLS AND MANTLE PLUMES

Peter Olson *In* NASA, Washington Geopotential Res. Mission (GRM) Oct. 1985 p 41-42 refs (For primary document see N86-12852 03-46)

Avail: NTIS HC A07/MF A01 CSCL 08E

Most of the intraplate oceanic hot spots are located on the crest of broad topographic swells in the sea floor. These swells have Gaussian shaped profiles, with up to 1.6 km of relief and half widths of 200 to 300 km. Swells are accompanied by positive geoid height anomalies with amplitudes of 6 to 8 m. In the Atlantic and Pacific basins swells cover an area equal to 10% of the Earth's surface. Next to boundary layer contraction, swells are the most important cause of uplift and subsidence in oceanic lithosphere. Calculation of buoyancy supported topography and geoid height were combined with uplift data from laboratory experiments to assess whether sea floor swell can be produced by mantle plumes. The critical constraints are: (1) swell topographic profiles; (2) geoid height/topographic height ratios; and (3) uplift rates, estimated to be 0.2 km/ma. E.A.K.

N86-12867*# Cornell Univ., Ithaca, N.Y. Dept. of Geological Sciences.

PROPERTIES OF THE LITHOSPHERE AND ASTHENOSPHERE DEDUCED FROM GEOID OBSERVATIONS

Donald L. Turcotte *In* NASA, Washington Geopotential Res. Mission (GRM) Oct. 1985 p 44-45 (For primary document see N86-12852 03-46)

Avail: NTIS HC A07/MF A01 CSCL 08E

Data from the GEOS-3 and SEASAT Satellites provided a very accurate geoid map over the oceans. Broad bathymetric features in the oceans such as oceanic swells and plateaus are fully compensated. It is shown that the geoid anomalies due to the

density structures of the lithosphere are proportional to the first moment of the density distribution. The deepening of the ocean basins is attributed to thermal isostasy. The thickness of the oceanic lithosphere increases with age due to the loss of heat to the sea floor. Bathymetry and the geoid provide constraints on the extent of this heat loss. Offsets in the geoid across major fracture zones can also be used to constrain this problem. Geoid bathymetry correlations show that the Hawaiian and Bermuda swells and the Cape Verde Rise are probably due to lithospheric thinning. E.A.K.

N86-12868*# National Geodetic Survey, Rockville, Md. Charting and Geodetic Services.

SUBDUCTION DYNAMICS: CONSTRAINTS FROM GRAVITY FIELD OBSERVATIONS Abstract Only

David C. McAdoo *In* NASA, Washington Geopotential Res. Mission (GRM) Oct. 1985 p 46 (For primary document see N86-12852 03-46)

Avail: NTIS HC A07/MF A01 CSCL 08E

Satellite systems do the best job of resolving the long wavelength components of the Earth's gravity field. Over the oceans, satellite-borne radar altimeters such as SEASAT provide the best resolution observations of the intermediate wavelength components. Satellite observations of gravity contributed to the understanding of the dynamics of subduction. Large, long wavelength geoidal highs generally occur over subduction zones. These highs are attributed to the superposition of two effects of subduction: (1) the positive mass anomalies of subducting slabs themselves; and (2) the surface deformations such as the trenches convectively inducted by these slabs as they sink into the mantle. Models of this subduction process suggest that the mantle behaves as a nonNewtonian fluid, its effective viscosity increases significantly with depth, and that large positive mass anomalies may occur beneath the seismically defined Benioff zones. E.A.K.

N86-12869*# Ohio State Univ., Columbus. Dept. of Geology and Mineralogy.

CONTINENTAL AND OCEANIC MAGNETIC ANOMALIES: ENHANCEMENT THROUGH GRM

Ralph R. B. vonFrese and William J. Hinze (Purdue Univ., Lafayette, Ind.) *In* NASA, Washington Geopotential Res. Mission (GRM) Oct. 1985 p 47-51 Previously announced as N85-31598 (For primary document see N86-12852 03-46)

Avail: NTIS HC A07/MF A01 CSCL 08G

In contrast to the POGO and MAGSAT satellites, the Geopotential Research Mission (GRM) satellite system will orbit at a minimum elevation to provide significantly better resolved lithospheric magnetic anomalies for more detailed and improved geologic analysis. In addition, GRM will measure corresponding gravity anomalies to enhance our understanding of the gravity field for vast regions of the Earth which are largely inaccessible to more conventional surface mapping. Crustal studies will greatly benefit from the dual data sets as modeling has shown that lithospheric sources of long wavelength magnetic anomalies frequently involve density variations which may produce detectable gravity anomalies at satellite elevations. Furthermore, GRM will provide an important replication of lithospheric magnetic anomalies as an aid to identifying and extracting these anomalies from satellite magnetic measurements. The potential benefits to the study of the origin and characterization of the continents and oceans, that may result from the increased GRM resolution are examined. M.G.

N86-12870*# Toronto Univ. (Ontario). Dept. of Geology.

THE RESOLUTION OF A MAGNETIC ANOMALY MAP EXPECTED FROM GRM DATA

D. W. Strangway, J. Arkani-Hamed, D. J. Teskey (Geological Survey of Canada, Ottawa, Ontario), and P. J. Hood (Geological Survey of Canada, Ottawa, Ontario) *In* NASA, Washington Geopotential Res. Mission (GRM) Oct. 1985 p 52-53 (For primary document see N86-12852 03-46)

Avail: NTIS HC A07/MF A01 CSCL 08G

Data from the MAGSAT mission were used to derive a global scalar magnetic anomaly map at an average altitude of about 400 km. It was possible to work with 2 data sets corresponding to dawn and dusk. The anomalies which were repeatable at dawn and at dusk was identified and the error limits of these anomalies were estimated. The repeatable anomalies were downward continued to about 10 km altitude. The anomalies over Canada were correlated quantitatively with bandpass filtered magnetic anomalies derived from aeromagnetic surveys. The close correlation indicates that the repeatable anomalies detected from orbit are due to geological causes. This correlation supports the geological significance of the global anomaly map. E.A.K.

N86-12871*# Cambridge Univ. (England). Dept. of Earth Sciences.

THE IMPORTANCE OF GRM GRAVITY OBSERVATIONS IN CONTINENTAL REGIONS Abstract Only

Dan P. McKenzie *In* NASA, Washington Geopotential Res. Mission (GRM) Oct. 1985 p 56 (For primary document see N86-12852 03-46)

Avail: NTIS HC A07/MF A01 CSCL 08E

Altimetric satellites showed the existence of gravity anomalies with wavelengths between 1500 km and 3000 km which correlated with residual depth anomalies. It was suggested that there is also an even smaller scale convective circulation with a wavelength of less than 500 km. Numerical experiments and SEASAT profiles demonstrate that similar small scale circulation must also exist near fracture zones. The mantle therefore must contain at least three scales of circulation: (1) comparable to the plate dimensions, the large scale circulation, which returns material from the Island arcs to the ridges; (2) an intermediate scale comparable to the depth of the upper mantle; and (3) a small scale comparable to the thickness of the asthenosphere. This picture was established by observations of gravity and bathymetry in oceanic regions. E.A.K.

N86-12872*# California Inst. of Tech., Pasadena. Seismological Lab.

THE SOURCE OF THE EARTH'S LONG WAVELENGTH GEOID ANOMALIES: IMPLICATIONS FOR MANTLE AND CORE DYNAMICS

Bradford H. Hager, Mark A. Richards, and Richard J. OConnell (Harvard Univ., Cambridge, Mass.) *In* NASA, Washington Geopotential Res. Mission (GRM) Oct. 1985 p 57-59 (For primary document see N86-12852 03-46)

Avail: NTIS HC A07/MF A01 CSCL 08E

The long wavelength components of the Earth's gravity field result mainly from density contrasts associated with convection in the mantle. Direct interpretation of the geoid for mantle convection is complicated by the fact that convective flow results in dynamically maintained deformation of the surface of the Earth, the core mantle boundary (CMB), and any interior chemical boundaries which might exist. These boundary deformations effect the geoid opposite in sign and are comparable in magnitude to those of the interior density contrasts driving the flow. The total difference of two relatively large quantities. E.A.K.

N86-12873*# Newcastle-upon-Tyne Univ. (England). School of Physics.

INTERPRETATION OF THE GEOID

S. K. Runcorn *In* NASA, Washington Geopotential Res. Mission (GRM) Oct. 1985 p 60-62 refs (For primary document see N86-12852 03-46)

Avail: NTIS HC A07/MF A01 CSCL 08E

The superposition of the first satellite geoid determined by Iszak upon Ootilla's geoid was based on surface gravity determinations. Good agreement was observed except over the Pacific area of the globe. The poor agreement over the Pacific was interpreted as the result of inadequate observations there. Many geoids were determined from satellite observations, including Doppler measurements. It is found that the geoid is the result of density differences in the mantle maintained since the primeval Earth by its finite strength. Various models based on this assumption are developed. E.A.K.

N86-12874*# Toronto Univ. (Ontario). Dept. of Physics.
MANTLE CONVECTION AND THE LARGE SCALE STRUCTURES OF THE EARTH'S GRAVITATIONAL FIELD Abstract Only
w. R. Peltier *In* NASA, Washington Geopotential Res. Mission (GRM) Oct. 1985 p 63 (For primary document see N86-12852 03-46)
Avail: NTIS HC A07/MF A01 CSCL 08G

The connection between the observed large scale structure of the Earths' gravitational field, as represented by the GEM10 model, and the surface kinematic manifestations of plate tectonics, as represented by the absolute plate motion model of Minster and Jordan, is explored using a somewhat novel method of analysis. Two scalar derivatives of the field of surface plate velocities, namely the horizontal divergence and the radial vorticity, are computed from the plate motion data. These two scalars are respectively determined by the poloidal and toroidal scalars in terms of which any essentially solenoidal vector field may be completely represented. They provide a compact summary of the observed plate boundary types in nature, with oceanic ridges and trenches being essentially boundaries of divergence, and transform faults being essentially boundaries of vorticity. Author

N86-12875*# Harvard Univ., Cambridge, Mass. Dept. of Geological Sciences.
CONSTRAINTS ON THE RHEOLOGICAL STRUCTURE OF THE MANTLE
Richard J. OConnell and Bradford H. Hager (California Inst. of Tech., Pasadena) *In* NASA, Washington Geopotential Res. Mission (GRM) Oct. 1985 p 64-65 (For primary document see N86-12852 03-46)
Avail: NTIS HC A07/MF A01 CSCL 08G

Rheological models of the mantle are at present limited to radial symmetry, usually with homogeneous linearly viscous or viscoelastic incompressible layers. While such models are probably overly simple, they readily allow calculation of geophysical effects, such as post glacial rebound and related changes in the Earth's shape. They are also directly applicable to problems of global mantle flow and plate motions. Author

N86-12876*# Arizona State Univ., Tempe. Dept. of Geology.
THE ROLE OF A PRESSURE-DEPENDENT RHEOLOGY IN THE DYNAMICS OF MANTLE CIRCULATION
David A. Yuen and Luce Fleitout (Paris-Sud Univ., Orsay, France) *In* NASA, Washington Geopotential Res. Mission (GRM) Oct. 1985 p 66-67 (For primary document see N86-12852 03-46)
Avail: NTIS HC A07/MF A01 CSCL 08G

A thermomechanical model for upper mantle convection was constructed such that the thickness and the structure of the lithosphere are determined self consistently by the heat transported by convection. In this study of the interaction between the lithosphere and upper mantle, strongly temperature and pressure dependent rheologies for both Newtonian and non-Newtonian creep mechanisms are employed. For a strictly temperature dependent rheology an insignificant amount of heat, less than 12.5 mW/sq m, can be transported convectively for an interior viscosity, 0(10 sup 21 Pas), compatible with post glacial rebound. On the other hand, for similar values of the interior viscosity, steady heat fluxes between 20 and 40 mW/sq m are produced by introducing pressure dependence into the rheology. For the temperature and pressure dependent flow law the horizontally averaged interior temperature displays very little variation with the amount of heat evacuated, once all of the rheological parameters are fixed. This finding may have important ramifications for parameterized convection. G.L.C.

N86-12877*# California Inst. of Tech., Pasadena. Siesmological Lab.
SMALL-SCALE CONVECTION BENEATH THE TRANSVERSE RANGES, CALIFORNIA: IMPLICATIONS FOR INTERPRETATION OF GRAVITY ANOMALIES Abstract Only
Eugene D. Humphreys and Bradford H. Hager *In* NASA, Washington Geopotential Res. Mission (GRM) Oct. 1985 p 68 ref (For primary document see N86-12852 03-46)
Avail: NTIS HC A07/MF A01 CSCL 08K

Tomograhic inversion of upper mantle P wave velocity heterogeneities beneath southern California shows two prominent features: an east-west trending curtain of high velocity material (up to 3% fast) in the upper 250 km beneath the Transverse Ranges and a region of low velocity material (up to 4% slow) in the 100 km beneath the Salton Trough. These seismic velocity anomalies were interpreted as due to small scale convection in the mantle. Using this hypothesis and assuming that temperature and density anomalies are linearly related to seismic velocity anomalies through standard coefficients of proportionality, leads to inferred variations of approx. + or - 300 C and approx. + or - 0.03 g/cc. G.L.C.

N86-12878*# Massachusetts Inst. of Tech., Cambridge. Dept. of Earth, Atmospheric and Planetary Sciences.
EVIDENCE FROM SATELLITE ALTIMETRY FOR SMALL-SCALE CONVECTION IN THE MANTLE
B. Parsons, W. F. Haxby (Lamont-Doherty Geological Observatory), D. P. McKenzie (Cambridge Univ.), A. B. Watts (Lamont-Doherty Geological Observatory), and J. K. Weissel (Lamont-Doherty Geological Observatory) *In* NASA, Washington Geopotential Res. Mission (GRM) Oct. 1985 p 69-70 refs (For primary document see N86-12852 03-46)
Avail: NTIS HC A07/MF A01 CSCL 08E

Small scale convection can be defined as that part of the mantle circulation in which upwellings and downwellings can occur beneath the lithosphere within the interiors of plates, in contrast to the large scale flow associated with plate motions where upwellings and downwellings occur at ridges and trenches. The two scales of convection will interact so that the form of the small scale convection will depend on how it arises within the large scale flow. Observations based on GEOS-3 and SEASAT altimetry suggest that small scale convection occurs in at least two different ways. G.L.C.

N86-12879*# Toronto Univ. (Ontario). Dept. of Physics.
MANTLE VISCOSITY, J2 AND THE NONTIDAL ACCELERATION OF EARTH ROTATION Abstract Only
W. R. Peltier *In* NASA, Washington Geopotential Res. Mission (GRM) Oct. 1985 p 71 (For primary document see N86-12852 03-46)
Avail: NTIS HC A07/MF A01 CSCL 08G

Recent interpretations of laser ranging for the LAGEOS satellite have rather conclusively established that the observed acceleration in the node of its orbit is just that expected to exist as a residual effect of the last deglaciation event which ended about 6000 years ago. The nontidal acceleration of rotation would be rather different than that observed if there were any significant melting of high latitude continental ice masses currently ongoing. The sensitivity of the expected nontidal acceleration to variations of several elements of the radial viscoelastic structure of the planet is explored using a new normal mode method for the computation of viscoelastic relaxation spectra. These calculations establish that the most important sensitivity is to variations in the mantle viscosity profile. Although the predicted nontidal acceleration does depend upon lithospheric thickness and on the elastic component of the radial structure, the dependence on these components of the structure is much weaker than it is upon mantle viscosity. The observed J sub 2 is therefore a particularly useful determinant of radial variations in the latter parameter. Author

N86-12880*# Geological Survey, Reston, Va.
MODELING GRAVITY AND MAGNETIC FIELDS FOR CRUSTAL AND UPPER MANTLE STRUCTURES
John M. DeNoyer *In* NASA, Washington Geopotential Res. Mission (GRM) Oct. 1985 p 72-73 (For primary document see N86-12852 03-46)
Avail: NTIS HC A07/MF A01 CSCL 08E

Research was conducted to: (1) make a direct comparison between the gravity and magnetic fields near the ellipsoid and at the height expected for the Geopotential Research Mission (GRM) for the same geologic model, (2) obtain realistic estimates of the

gradients that can be expected at the orbit height of the GRM, and (3) demonstrate the value of data that the GRM could provide for investigating upper mantle and deep crustal anomalies. Author

N86-12881*# Texas Univ., Austin. Center for Space Research.
ON THE GEOGRAPHICAL CORRELATION OF ORBIT ERROR Abstract Only c13
B. D. Tapley and G. W. Rosborough *In* NASA, Washington Geopotential Res. Mission (GRM) Oct. 1985 p 76 (For primary document see N86-12852 03-46)
Avail: NTIS HC A07/MF A01 CSCL 22C

The orbit accuracies needed to support the global crustal dynamics project and recent satellite altimeter missions have placed unique demands on the data analysis and orbit analysis systems. These demands include accurate and well distributed observations, improved computational techniques and substantial enhancements in the force models which represent the satellite's motion. For example, the satellite altimeter mission (TOPEX), whose objectives will be: (1) to measure the time variable ocean surface topography, and (2) to demonstrate the ability to map the general ocean circulation, requires that the radial component of the satellite's orbit be known with an rms accuracy of 13 cm for the three year mission lifetime. The primary force model uncertainty which limits the contemporary orbit computation accuracy is the inaccuracy in the values assigned to the spherical harmonic coefficients used to model the Earth's gravity field. Author

N86-12882*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
GLOBAL MEAN SEA SURFACE COMPUTATION BASED UPON A COMBINATION OF SEASAT AND GEOS-3 SATELLITE ALTIMETER DATA Abstract Only c48
J. G. Marsh, C. J. Koblinsky, A. Brenner (Edgerton, Germeshausen and Grier, Inc., Riverdale, Md.), B. Beckley (Edgerton, Germeshausen and Grier, Inc., Riverdale, Md.), and T. Martin (Edgerton, Germeshausen and Grier, Inc., Riverdale, Md.) *In* NASA, Washington Geopotential Res. Mission (GRM) Oct. 1985 p 77 (For primary document see N86-12852 03-46)
Avail: NTIS HC A07/MF A01 CSCL 08J

A mean sea surface map was computed for the global ocean areas between 70 deg N latitude and 62 deg S latitude based upon the 70 day SEASAT and 3.5 year GEOS-3 altimeter data sets. The mean sea surface is presented in the form of a global contour map and a 0.25 deg x 0.25 deg grid. A combination of regional adjustments based upon crossover techniques and the subsequent adjustment of the regional solutions into a global reference system was employed in order to minimize the effects of radial orbit error. A global map of the crossover residuals after the crossover adjustments are made is in good agreement with earlier mesoscale variability contour maps based upon the last month of SEASAT collinear data. This high level of agreement provides good evidence that relative orbit error was removed to the decimeter level on a regional basis. This represents a significant improvement over our previous maps which contained patterns, particularly in the central Pacific, which were due to radial orbit error. Long wavelength, basin scale errors are still present with a submeter amplitude due to errors in the PGS-S4 gravity model. Such errors can only be removed through the improvement of the Earth's gravity model and associated geodetic parameters. Author

N86-12883*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
CONTRIBUTIONS OF GRM TO THE OCEAN TOPOGRAPHY EXPERIMENT (TOPEX) Abstract Only c48
Robert Stewart *In* NASA, Washington Geopotential Res. Mission (GRM) Oct. 1985 p 78 (For primary document see N86-12852 03-46)
Avail: NTIS HC A07/MF A01 CSCL 08J

The permanent shape of the sea surface, the time averaged mean sea level, is comprised of: (1) an ellipsoidal component due to the mean mass of a rotating Earth; (2) spatial undulations due to the inhomogeneous distribution of mass in the Earth; and (3) spatial undulations due to permanent ocean currents. The amplitude of the three components are in the ratio 10,000 : 100 : 1 m, the first two components comprising the marine geoid, and the third being the permanent topography of the sea surface. G.L.C.

N86-12884*# Woods Hole Oceanographic Institution, Mass.
SEPARATION OF CORE AND CRUSTAL MAGNETIC FIELD SOURCES
L. Shure, R. L. Parker, and R. A. Langel *In* NASA, Washington Geopotential Res. Mission (GRM) Oct. 1985 p 80-81 refs (For primary document see N86-12852 03-46)
Avail: NTIS HC A07/MF A01 CSCL 08G

Fluid motions in the electrically conducting core and magnetized crustal rocks are the two major sources of the magnetic field observed on or slightly above the Earth's surface. The exact separation of these two contributions is not possible without imposing a priori assumptions about the internal source distribution. Nonetheless models like these were developed for hundreds of years Gauss' method, least squares analysis with a truncated spherical harmonic expansion was the method of choice for more than 100 years although he did not address separation of core and crustal sources, but rather internal versus external ones. Using some arbitrary criterion for appropriate truncation level, we now extrapolate downward core field models through the (approximately) insulating mantle. Unfortunately our view can change dramatically depending on the degree of truncation for describing core sources. G.L.C.

N86-12885*# Cambridge Univ. (England).
THE MAGNETIC FIELD AT THE CORE-MANTLE BOUNDARY
Jeremy Bloxham and David Gubbins *In* NASA, Washington Geopotential Res. Mission (GRM) Oct. 1985 p 82-84 refs (For primary document see N86-12852 03-46)
Avail: NTIS HC A07/MF A01 CSCL 08N

Models of the geomagnetic field are, in general, produced from a least-squares fit of the coefficients in a truncated spherical harmonic expansion to the available data. Downward continuation of such models to the core-mantle boundary (CMB) is an unstable process: the results are found to be critically dependent on the choice of truncation level. Modern techniques allow this fundamental difficulty to be circumvented. The method of stochastic inversion is applied to modeling the geomagnetic field. Prior information is introduced by requiring that the spectrum of spherical harmonic coefficients to fall-off in a particular manner which is consistent with the Ohmic heating in the core having a finite lower bound. This results in models with finite errors in the radial field at the CMB. Curves of zero radial field can then be determined and integrals of the radial field over patches on the CMB bounded by these null-flux curves calculated. With the assumption of negligible magnetic diffusion in the core; frozen-flux hypothesis, these integrals are time-invariant. G.L.C.

N86-12886*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SOME ANTICIPATED CONTRIBUTIONS TO CORE FLUID DYNAMICS FROM THE GRM
Coerte VanVorhies *In* NASA, Washington Geopotential Res. Mission (GRM) Oct. 1985 p 85-88 refs (For primary document see N86-12852 03-46)
Avail: NTIS HC A07/MF A01 CSCL 08G

It is broadly maintained that the secular variation (SV) of the large scale geomagnetic field contains information on the fluid dynamics of Earth's electrically conducting outer core. The electromagnetic theory appropriate to a simple Earth model has recently been combined with reduced geomagnetic data in order to extract some of this information and ascertain its significance. The simple Earth model consists of a rigid, electrically insulating mantle surrounding a spherical, inviscid, and perfectly conducting liquid outer core. This model was tested against seismology by using truncated spherical harmonic models of the observed geomagnetic field to locate Earth's core-mantle boundary, CMB. Further electromagnetic theory has been developed and applied to the problem of estimating the horizontal fluid motion just beneath

CMB. Of particular geophysical interest are the hypotheses that these motions: (1) include appreciable surface divergence indicative of vertical motion at depth, and (2) are steady for time intervals of a decade or more. In addition to the extended testing of the basic Earth model, the proposed GRM provides a unique opportunity to test these dynamical hypotheses. G.L.C.

N86-12887*# Brown Univ., Providence, R. I. Dept. of Geological Sciences.
RATIONALE FOR A GRAVSAT-MAGSAT MISSION: A PERSPECTIVE ON THE PROBLEM OF EXTERNAL/INTERNAL TRANSIENT FIELD EFFECTS
John F. Hermance *In* NASA, Washington Geopotential Res. Mission (GRM) Oct. 1985 p 89-91 refs (For primary document see N86-12852 03-46)
Avail: NTIS HC A07/MF A01 CSCL 08N

The Earth's magnetic field at MAGSAT altitudes not only has contributions from the Earth's core and static magnetization in the lithosphere, but also from external electric current systems in the ionosphere and magnetosphere, along with induced electric currents flowing in the conducting earth. Hermance assessed these last two contributions; the external time-varying fields and their associated internal counter-parts which are electromagnetically induced. It is readily recognized that during periods of magnetic disturbance, external currents often contribute from 10's to 100's of nanoteslas (gammas) to observations of the Earth's field. Since static anomalies from lithospheric magnetization are of this same magnitude or less, these external source fields must be taken into account when attempting to delineate gross structural features in the crust. G.L.C.

N86-12888*# Geological Survey, Denver, Colo.
RECENT MAGSAT RESULTS
Joseph C. Cain *In* NASA, Washington Geopotential Res. Mission (GRM) Oct. 1985 p 92-101 refs (For primary document see N86-12852 03-46)
Avail: NTIS HC A07/MF A01 CSCL 08N

Meyer, et al. have improved their original global crustal model and made a spherical harmonic analysis of the resulting magnetic field to n=50. The Z contours at 400 Km altitude from a field model composed of the first 15 degrees and order of their model and the terms n=16 to 29 from the MAGSAT model M051782 are presented. The main point to consider from such representations is that the lower order terms appear to contribute components comparable in magnitude to those of higher order. Thus, one should allow in making tectonic interpretations of global maps of anomalies such as those published by Langel, that there are likely continental scale (or smaller) features that have been removed along with the core field by the subtraction of the terms n=1 to 13 of the observed field. Planning for the analysis of data to be accrued by GRM should thus address this problem. G.L.C.

N86-12889*# California Univ., San Diego, La Jolla.
MODELING CURRENTS AT SATELLITE ALTITUDES Abstract Only
G. E. Backus *In* NASA, Washington Geopotential Res. Mission (GRM) Oct. 1985 p 102 (For primary document see N86-12852 03-46)
Avail: NTIS HC A07/MF A01 CSCL 20C

A mathematical formalism for modeling the poloidal magnetic field and current density at satellite altitudes is presented. G.L.C.

N86-12890*# Colorado Univ., Boulder. Dept. of Astrophysical, Planetary and Atmospheric Sciences.
EXPECTED CONTRIBUTION OF THE GEOPOTENTIAL RESEARCH MISSION (GRM) TO STUDIES OF LIQUID CORE FLUID DYNAMICS
Edward R. Benton *In* NASA, Washington Geopotential Res. Mission (GRM) Oct. 1985 p 103-104 (For primary document see N86-12852 03-46)
Avail: NTIS HC A07/M A01 CSCL 08G

Finding satisfactory models of the fluid motions at the top of the core is important for delineating what kind of dynamo is in operation, for estimating the heat flux into the base of the mantle, and for forecasting the magnetic field forward in time. Each of these aspects will be discussed. G.L.C.

N86-12891*# Miami Univ., Fla. School of Marine and Atmospheric Science.
THE SOURCE OF THE INTERMEDIATE WAVELENGTH COMPONENT OF THE EARTH'S MAGNETIC FIELD
C. G. A. Harrison *In* NASA, Washington Geopotential Res. Mission (GRM) Oct. 1985 p 105-106 (For primary document see N86-12852 03-46)
Avail: NTIS HC A07/MF A01 CSCL 08G

The intermediate wavelength component of the Earth's magnetic field has been well documented by observations made by MAGSAT. It has been shown that some significant fraction of this component is likely to be caused within the core of the Earth. Evidence for this comes from analysis of the intermediate wavelength component revealed by spherical harmonics between degrees 14 and 23, in which it is shown that it is unlikely that all of this signal is crustal. Firstly, there is no difference between average continental source strength and average oceanic source strength, which is unlikely to be the case if the anomalies reside within the crust, taking into account the very different nature and thickness of continental and oceanic crust. Secondly, there is almost no latitudinal variation in the source strength, which is puzzling if the sources are within the crust and have been formed by present or past magnetic fields with a factor of two difference in intensity between the equator and the poles. If however most of the sources for this field reside within the core, then these observations are not very surprising. G.L.C.

N86-12892*# California Univ., San Diego, La Jolla.
DOES THE GEOID DRIFT WEST? Abstract Only
G. E. Backus, R. L. Parker, and M. A. Zumberge *In* NASA, Washington Geopotential Res. Mission (GRM) Oct. 1985 p 107 (For primary document see N86-12852 03-46)
Avail: NTIS HC A07/MF A01 CSCL 08E

In 1970 Hide and Malin noted a correlation of about 0.8 between the geoid and the geomagnetic potential at the Earth's surface when the latter is rotated eastward in longitude by about 160 degrees and the spherical harmonic expansions of both functions are truncated at degree 4. From a century of magnetic observatory data, Hide and Malin inferred an average magnetic westward drift rate of about 0.27 degrees/year. They attributed the magnetic-gravitational correlation to a core event at about 1350 A.D. which impressed the mantle's gravity pattern at long wavelengths onto the core motion and the resulting magnetic field. The impressed pattern was then carried westward 160 degrees by the nsuing magnetic westward drift. An alternative possibility is some sort of steady physical coupling between the magnetic and gravitational fields (perhaps migration of Hide's bumps on the core-mantle interface). This model predicts that the geoid will drift west at the magnetic rate. On a rigid earth, the resulting changes in sea level would be easily observed, but they could be masked by adjustment of the mantle if it has a shell with viscosity considerably less than 10 to the 21 poise. However, steady westward drift of the geoid also predicts secular changes in g, the local acceleration of gravity, at land stations. These changes are now ruled out by recent independent high-accuracy absolute measurements of g made by several workers at various locations in the Northern Hemisphere. Author

N86-12893*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
GRM AS A FOLLOW-ON TO MAGSAT
R. A. Langel *In* NASA, Washington Geopotential Res. Mission (GRM) Oct. 1985 p 108-109 (For primary document see N86-12852 03-46)
Avail: NTIS HC A07/MF A01 CSCL 08G

MAGSAT was the first near-Earth spacecraft dedicated to measurement of the vector geomagnetic field. Its objectives were to use the vector measurements to measure and model both the main field and the crustal field of the Earth. The main field

measurements were to be used for the 1980 world charts and to study the Earth's core. The crustal fields were to be utilized to aid in modeling large-scale variations in the geologic and geophysical characteristics of the crust. G.L.C.

N86-12894*# EROS Data Center, Sioux Falls, S. Dak.
ON THE INTERPRETATION OF SATELLITE-DERIVED GRAVITY AND MAGNETIC DATA FOR STUDIES OF CRUSTAL GEOLOGY AND METALLOGENESIS
David A. Hastings *In* NASA, Washington Geopotential Res. Mission (GRM) Oct. 1985 p 110-113 ref (For primary document see N86-12852 03-46)
Avail: NTIS HC A07/MF A01 CSCL 08G

Satellite-derived global gravity and magnetic maps have been shown to be useful in large-scale studies of the Earth's crust, despite the relative infancy of such studies. Numerous authors have made spatial associations of gravity or magnetic anomalies with geological provinces. Gravimetric interpretations are often made in terms of isostasy, regional variations of density, or of geodesy in general. Interpretations of satellite magnetic anomalies often base assumptions of overall crustal magnetism on concepts of the vertical and horizontal distribution of magnetic susceptibility, then make models of these assumed distributions. The opportunity of improving our satellite gravity and magnetic data through the proposed Geopotential Research Mission should considerably improve the scientific community's ability to analyze and interpret global magnetic and gravity data. G.L.C.

N86-12895*# EROS Data Center, Sioux Falls, S. Dak. Technicolor Government Services, Inc.
DO MAGSAT ANOMALIES CONTAIN A RECORD OF PAST AND PRESENT-DAY MANTLE CONVECTION UNDER SOUTH AMERICA? Abstract Only
David A. Hastings *In* NASA, Washington Geopotential Res. Mission (GRM) Oct. 1985 p 114 ref (For primary document see N86-12852 03-46)
Avail: NTIS HC A07/MF A01 CSCL 08G

Global anomaly maps from the National Aeronautics and Space Administration's Magnetic Field Satellite (MAGSAT) have been spatially filtered to reduce the prominence of long-wavelength east-west bands and to improve the discrimination of anomalies within structural provinces. Previous research suggested a correlation between total-field MAGSAT anomaly lows in equatorial regions with crustal bodies of relatively high average magnetic susceptibility (such as Archaean shields), and of anomaly highs with bodies of low susceptibility (such as deep parts of basins). These correlations reverse at higher latitudes. G.L.C.

N86-12896# Air Force Geophysics Lab., Hanscom AFB, Mass.
PRECIPITATING ELECTRON AND ION DETECTORS (SSJ/4) FOR THE BLOCK 5D/FLIGHTS 6-10 DMSP (DEFENSE METEOROLOGICAL SATELLITE PROGRAM) SATELLITES: CALIBRATION AND DATA PRESENTATION
D. A. Hardy, L. K. Schmitt, M. S. Gussenhoven, F. J. Marshall, and H. C. Yeh 21 Nov. 1984 59 p
(AF Proj. 7601)
(AD-A157080; AFGL-TR-84-0317; AFGL-ERP-902) Avail: NTIS HC A04/MF A01 CSCL 04/1

The satellites of the Defense Meteorological Satellite Program (DMSP) are flown operationally to provide data for the specification of terrestrial weather and the near Earth space environment. In support of space environment specification the satellites starting the F6, carry an improved set of electrostatic analyzers SSJ/4, designed to measure the flux of precipitating electrons and ions with energies between 30 eV and 30 keV. The data from these analyses are routinely processed at AFCL and are available to the scientific community. Both by itself, and in combination with other sensors on the satellite, the SSJ/4 detectors provide important data for the study of auroral processes. This report was prepared to facilitate the widespread use of the SSJ/4 data.
Author (GRA)

N86-12897# Naval Research Lab., Washington, D. C.
A SIMULATION OF HIGH LATITUDE F-LAYER INSTABILITIES IN THE PRESENCE OF MAGNETOSPHERE-IONOSPHERE COUPLING
H. G. Mitchell, Jr., J. A. Fedder, M. J. Keskinen, and S. T. Zalesak 8 Jul. 1985 29 p Sponsored in part by NASA and DNA
(RR0-3302)
(NASA-CR-176296; NAS 1.26:176296; AD-A157475) Avail: NTIS HC A03/MF A01 CSCL 04A

A magnetic-field-line-integrated model of plasma interchange instabilities is developed for the high latitude ionosphere including magnetospheric coupling effects. We show that primary magnetosphere-ionosphere coupling effect is to incorporate the inertia of the magnetospheric plasma in the analysis. As a specific example, we present the first simulation of the E x B instability in the inertial regime, i.e., nu sub i < omega where nu sub i is the ion-neutral collision frequency and omega is the wave frequency. We find that the inertial E x B instability develops in a fundamentally different manner than in the collisional case ni sub i < omega. Our results show that striations produced in the inertial regime are spread and retarded by ion inertial effects, and result in more isotropic irregularities than those seen in the collisional case. GRA

N86-12898# Aerospace Corp., El Segundo, Calif. Space Sciences Lab.
AN ALTERNATIVE INTERPRETATION OF ION RING DISTRIBUTION OBSERVED BY THE S3-3 SATELLITE
D. J. Gorney 15 May 1985 18 p
(Contract F04701-83-C-0084)
(AD-A157655; TR-0084A(5940-05)-3; SD-TR-85-14) Avail: NTIS HC A02/MF A01 CSCL 04/1

Recently, theoretical interest has grown in possible plasma wave instabilities arising from free energy in auroral ion distributions, and a number of ion-mode instabilities have been identified. These instabilities typically rely on positive slopes in the ion's velocity distribution parallel (del f/del v(sub par) > 0) or perpendicular (del f/del v(sub perp) > 0) to the magnetic field. Upflowing ion beams generated by electrical potential drops along auroral field lines are obvious candidates for the parallel (beam) instability, while ion conics have been treated in the limit of the flute mode instability, assuming that a positive perpendicular gradient exists. However, ion conics are not responsible for the condition del f/del v(sub perp) > 0. Downflowing ion beam distributions can have del f/del v(sub perp) > 0 and therefore might lead to flute mode instability. Examples of both conics and downflowing beams are presented, showing that only the downflowing component leads to significant del f/del v(sub perp) > 0, while ion conics generally have del f/del v(sub perp) < 0 and are themselves stable to the flute mode. GRA

N86-12899# Aerospace Corp., Germantown, Md. Space Sciences Lab.
EFFECTS OF WHISTLER-MODE AND OTHER WAVES IN THE MAGNETOSPHERE Final Report, 1981 - 1984
M. Schultz, A. L. Vampola, and D. J. Boucher, Jr. 20 Jun. 1985 108 p
(Contract F04701-83-C-0084)
(AD-A157832; TR-0084(4613)-1; SD-TR-85-24) Avail: NTIS HC A06/MF A01 CSCL 04/1

This report covers progress on three research topics related to the dynamics of natural and artificial radiation belts, with emphasis on the consequences of interactions between geomagnetically trapped electrons and waves that propagate in the magnetospheric plasma. Part 1 includes a review of the Kennel-Petschek saturation concept and a solution of the model nonlinear differential equation that describes the evolution of charged-particle intensities above, near, and below saturation level. Part 2 provides an estimate of the limiting energy spectrum of a saturated radiation belt of specified pitch-angle anisotropy. Part 3 provides a review of eigenfunction methods in pitch-angle diffusion theory and a prescription for constructing optimal basis functions for the numerical calculation of eigenvalues and eigenfunctions of the pitch-angle diffusion operator. GRA

N86-12900# Weston Observatory, Mass.
INVESTIGATION OF MAGNETIC FIELD MEASUREMENTS Final Report, 1 Jun. 1982 - 30 Sep. 1984
J. F. Devane Mar. 1985 21 p
(Contract F19628-82-K-0040)
(AD-A157924; AFGL-TR-85-0054) Avail: NTIS HC A02/MF A01 CSCL 08/14

Weston Observatory of Boston College has cooperated with AFGL personnel in the maintenance of the Air Force Geomagnetic Magnetometer Network. The computer facilities for processing the data of the Network were upgraded. Fluxgate data for every month of the period 1978-1983 has been deposited in World Data Center A. Daily magnetograms have been produced and will be published by AFGL. Some preliminary processing data to establish substation conductivity was initiated. The Network was discontinued in December 1983. GRA

N86-12901# Alaska Univ., Fairbanks. Geophysical Inst.
CARBON DIOXIDE IN ARCTIC AND SUBARCTIC REGIONS Final Report
T. Gosnik and J. J. Melley Jun. 1985 218 p
(Contract DE-AT06-80EV-10429)
(DE85-014054; DOE/EV-10429/T2) Avail: NTIS HC A10/MF A01

Summaries and interpretations of the data collected for carbon dioxide partial pressures in the air and water are given. Sections were individually abstracted for inclusion in the data base. DOE

N86-12902# University of Southwestern Louisiana, Lafayette. Dept. of Geology.
HIGH-RESOLUTION, THREE-DIMENSIONAL, SEISMIC SURVEY OVER THE GEOPRESSURED-GEOTHERMAL RESERVOIR AT PARCPERDUE, LOUISIANA Final Report, 1 Jan. 1981 - 31 Jul. 1985
G. L. Kinsland Jul. 1985 290 p refs
(Contract DE-AC08-81NV-10185)
(DE85-016465; DOE/NV-10185/1) Avail: NTIS HC A13/MF A01

A high resolution three-dimensional seismic survey was performed over the reservoir of the geopressured-geothermal production experiment at Parcperdue, Louisiana and high quality results have been obtained. The reservoir is now mapped with more control and assurance than was possible with the previously existing data. Three differences between the map of this project and those available before are significant in the interpretation of the depletion experiment: (1) the western bounding fault is further west leading to a larger reservoir volume; (2) a down to the north (relief) fault through the reservoir has been found; and (3) there are structural highs in which small petroleum accumulations may exist within the reservoir. An original goal of testing the before and after seismic experiment idea as a production monitor has not been realized. However, the quality of the data at the stages of processing presently available is high enough that, had the well not failed, it would have been prudent to have proceeded with the project toward the second experiment. DOE

N86-12903# California Univ., Berkeley. Lawrence Berkeley Lab.
GRAVITY THEORIES IN MORE THAN FOUR DIMENSIONS
B. Zumino Mar. 1985 7 p refs Presented at the Modern Methods in Quantum Field Theory Conf., Amalfi, Italy, 7 May 1984
(Contract DE-AC03-76SF-00098)
(DE85-011164; LBL-19302; CONF-8405312-1) Avail: NTIS HC A02/MF A01

String theories suggest particular forms for gravity interactions in higher dimensions. We consider an interesting class of gravity theories in more than four dimensions, clarify their geometric meaning and discuss their special properties. DOE

N86-12904# Los Alamos National Lab., N. Mex.
MAGNETIC RECONNECTION IN THE TERRESTRIAL MAGNETOSPHERE
W. C. Feldman 1984 14 p Presented at the Am. Inst. of Phys. Conf., Taos, N. Mex., 6 Aug. 1984
(Contract W-7405-eng-36)
(DE85-014107; LA-UR-85-2092; CONF-8408121-5) Avail: NTIS HC A02/MF A01

Quantitative comparisons between measured phenomena in the terrestrial magnetosphere thought to be associated with magnetic reconnection, and related theoretical predictions based on Petschek's simple model are reviewed. Although such a comparison cannot be comprehensive because of the extended nature of the process and the relatively few in situ multipoint measurements made to date, the agreement is impressive where comparisons were possible. This result leaves little doubt that magnetic reconnection does indeed occur in the terrestrial magnetosphere. The maximum reconnection rate, expressed in terms of the inflow Mach number, M sub A, is measured to be M sub A = 0.2 + or - 0.1. DOE

N86-12905# National Geodetic Survey, Rockville, Md.
GEODETICALLY DERIVED STRAIN FROM SAN FRANCISCO BAY TO THE MENDOCINO TRIPLE JUNCTION, CALIFORNIA
M. W. Cline, R. A. Snay, and E. L. Timmerman Apr. 1985 23 p refs
(PB85-198802; NOAA-TR-NOS-109; NGS-31) Avail: NTIS HC A02/MF A01 CSCL 08G

Geodetic data comprised of triangulation, trilateration, and astronomic azimuths observed since late 1906 to 1978 are used to obtain models of horizontal crustal deformation in California. The three regional models roughly cover the California Coast Ranges from San Francisco Bay northward to the Mendocino Triple Junction and from the Great Valley westward to the Pacific Ocean. Each of the three regions is partitioned into a mosaic of districts that are allowed to individually translate, rotate, and deform homogeneously as a linear function of time. By approximating the known geologic faults with district boundaries, the relative motion between districts represents secular fault slip. To study the transient postseismic effects of the 1906 San Francisco earthquake, the data for 1931 to 1978 time interval are separately modeled, and these models are compared with those for the entire time interval. GRA

N86-12906# North Carolina State Univ., Raleigh.
EXPERIMENTAL STUDY OF FLOW AND DISPERSION IN THE WAKES OF THREE-DIMENSIONAL LOW HILLS
S. P. S. Arya and P. S. Gadiyaram 1985 49 p refs
(PB85-193266; EPA-600/D-85/094) Avail: NTIS HC A03/MF A01 CSCL 04A

The EPA Meteorological Wind Tunnel was used to simulate a rural atmospheric boundary layer. Experiments were conducted on flow and dispersion over three-dimensional, conical hills of two different slopes (26.5 degrees and 17.5 degrees) whose heights were 1/3 of the boundary layer depth. These measurements were made both in undisturbed and disturbed (in presence of hill) flow, using hot-wire anemometers and hydrocarbon analyzers. Enhanced vertical and lateral dispersion were evident in the immediate wake region of the hill. This phenomenon reflects the increased turbulence levels in the wake. The results clearly illustrate that the slope of a conical hill is a most important parameter; it determines the location of flow separation, the size of the cavity region, and the characteristics of the wake flow dispersion. GRA

N86-12641# Joint Publications Research Service, Arlington, Va.
MODELING OF SEASONAL EVOLUTION OF CARBON CYCLE IN OCEAN-ATMOSPHERE SYSTEM Abstract Only
B. A. Kagan, V. A. Ryabchenko, and A. S. Safray *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 13 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atm. i Okeana (Moscow), v. 21, no. 1, Jan. 1985 p 66-75 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

N86-12645# Joint Publications Research Service, Arlington, Va.
UPPER MESOZOIC TURBIDITES OF SOUTHERN WEST SAKHALIN DOWNWARP Abstract Only
S. V. Zyabrev *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006)

19 Jun. 1985 p 15-16 Transl. into ENGLISH from Tikhookeanskaya Geol. (Novosibirsk), no. 5, Sep. - Oct. 1984 p 22-33 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

N86-12650# Joint Publications Research Service, Arlington, Va.
PETROCHEMICAL TYPES OF MAGMATIC ROCKS OF OCEAN FLOOR AND PATTERNS OF THEIR DISTRIBUTION Abstract Only
A. V. Abramov, V. M. Ryakhovskiy, and Yu. V. Mironov *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 19 Transl. into ENGLISH from Byul. Mosk. Obshch. Ispytateley Prirody: Otd. Geol. (Moscow), v. 60, no. 1, Jan. - Feb. 1985 p 18-27 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

N86-12651# Joint Publications Research Service, Arlington, Va.
INTRUSIVE ROCKS OF OCEANIC LITHOSPHERE AS POSSIBLE SOURCES OF ANOMALOUS MAGNETIC FIELD OF OCEAN Abstract Only
Ye. A. Nazarova *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 19-20 Transl. into ENGLISH from Byul. Mosk. Obshch. Ispytateley Prirody: Otd. Geol. (Moscow), v. 60, no. 1, Jan. - Feb. 1985 p 28-41 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

N86-12652# Joint Publications Research Service, Arlington, Va.
MAGMATIC PROVINCES AND TECTONICS IN PACIFIC OCEAN Abstract Only
Yu. M. Pushcharovskiy *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 21 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Ser. Geol. (Moscow), no. 11, Nov. 1984 p 13-18 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

N86-12657# Joint Publications Research Service, Arlington, Va.
PETROLOGIC ASPECT OF FORMATION OF GEOSTRUCTURES IN MARGINAL SEAS Abstract Only
L. L. Perchuk *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 25-26 Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 280, no. 1, Jan. 1985 p 178-182 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

N86-12658# Joint Publications Research Service, Arlington, Va.
SPREADING IN DEVELOPMENT OF OCEANIC STRUCTURES Abstract Only
Yu. M. Pushcharovskiy and S. V. Ruzhentsev *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 26 Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 280, no. 1, Jan. 1985 p 182-185 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

N86-12661# Joint Publications Research Service, Arlington, Va.
POSSIBILITY OF SOUNDING EARTH BY USING ELECTROMAGNETIC FIELD OF SEA CURRENT Abstract Only
V. P. Smagin, G. A. Fonarev, and V. N. Savchenko *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 29 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Zemli (Moscow), no. 2, Feb. 1985 p 70-74 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

N86-12663# Joint Publications Research Service, Arlington, Va.
STRATIGRAPHY OF SEDIMENTS IN CENTRAL AND EASTERN MEDITERRANEAN Abstract Only
V. M. Sorokin, M. S. Afanasyeva, V. G. Kurenkova, and N. B. Chernyshova *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 30 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Ser. Geol. (Moscow), no. 2, Feb. 1985 p 59-64 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

N86-12665# Joint Publications Research Service, Arlington, Va.
FIND OF RHEOLITES AND TRACHITES AND GEOLOGICAL SITUATION IN NORTHERN PART OF EAST INDIAN OCEAN SUBMARINE RIDGE Abstract Only
V. V. Reverdatto, V. V. Yeremeyev, A. Ya. Ilyev, A. A. Popov, P. M. Sychev, and V. N. Sharapov *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 34 Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 280, no. 4, Feb. 1985 p 960-963 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

N86-12666# Joint Publications Research Service, Arlington, Va.
EVALUATING SCREENING EFFECTS AND TUSNAMI DANGER IN BAYS Abstract Only
V. V. Ivanov, K. V. Simonov, and O. I. Garder *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 35 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atm. i Okeana (Moscow), v. 20, no. 12, Dec. 1984 p 1206-1214 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

N86-12677# Joint Publications Research Service, Arlington, Va.
COMPUTATIONS OF SEISMIC WAVE PROPAGATION VELOCITIES IN OCEAN BOTTOM SEDIMENTS FROM REFLECTED WAVES TRAVEL-TIME CURVES Abstract Only
V. N. Moskalenko, G. A. Semenov, and P. N. Kuzmin *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 46-47 Transl. into ENGLISH from Okeanol. (Moscow), v. 25, no. 1, Jan. - Feb. 1985 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

N86-12680# Joint Publications Research Service, Arlington, Va.
GRAVIMETRIC SURVEYING WITH MI-8 HELICOPTERS Abstract Only
V. Sopolev *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 52 Transl. into ENGLISH from Vozdushnyy Transport (Moscow), 18 Apr. 1985 p 4 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

N86-12681# Joint Publications Research Service, Arlington, Va.
MAGNETIC MINERALS AND CHARACTERISTICS OF NATURAL MAGNETIC STATE OF CORE IN SAATLY SUPERDEEP HOLE IN DEPTH RANGE 3500-7500 METERS Abstract Only
V. I. Bagin and Z. A. Novruzov *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 57 Transl. into ENGLISH from Izv. Akad. Nauk Azerb. SSR, Ser. Nauk o Zemle (USSR), no. 5, 1984 p 61-67 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

N86-12682# Joint Publications Research Service, Arlington, Va.
NEW METHODS FOR INTERPRETING SEISMIC WAVES IN STRATIFIED MEDIA Abstract Only
B. N. Lutsenko *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 58 Transl. into ENGLISH from Geol. Nefti i Gaza (Moscow), no. 1, Jan. 1985 p 48-53 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

N86-12683# Joint Publications Research Service, Arlington, Va.
NEW APPROACH TO SOME PROBLEMS IN SEISMOLOGY Abstract Only
I. G. Kerimov *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 58-59 Transl. into ENGLISH from Izv. Akad. Nauk Azerb. SSR, Ser. Nauk o Zemle (USSR), no. 5, 1984 p 41-46 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

N86-12685# Joint Publications Research Service, Arlington, Va.
FEATURES OF FIELD OF DIRECTIONS AND VELOCITIES OF PROPAGATION OF FRACTURES AT EARTHQUAKE FOCI IN NORTHERN MUYA REGION OF BAYKAL RIFT ZONE Abstract Only

A. V. Solonenko and N. V. Solonenko *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 60 Transl. into ENGLISH from Vulkanol. i Seysmologiya (Moscow), no. 1, Jan. - Feb. 1985 p 98-105 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

N86-12689# Joint Publications Research Service, Arlington, Va.
COMPARISON OF SINGLE-PARAMETER STATISTICAL MODEL WITH RESULTS OF ROUND-THE-CLOCK MEASUREMENT OF LIGHT-SCATTERING MATRICES Abstract Only
M. A. Sviridenkov, G. I. Gorchakov, A. A. Isakov, and V. N. Sidorov *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 73 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atm. i Okeana (Moscow), v. 21, no. 1, Jan. 1985 p 22-31 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

N86-12690# Joint Publications Research Service, Arlington, Va.
IONIC MECHANICSM OF EXCHANGE OF ADMIXTURES BETWEEN HYDROSPHERE AND ATMOSPHERE Abstract Only
A. V. Savchenko and V. V. Smirnov *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 74 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atm. i Okeana (Moscow), v. 21, no. 1, Jan. 1985 p 32-41 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

N86-12694# Joint Publications Research Service, Arlington, Va.
EVALUATING INFLUENCE OF WAVES ON DYNAMIC STRUCTURE OF ATMOSPHERIC NEAR-WATER LAYER Abstract Only
K. L. Yegorov *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 76 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atm. i Okeana (Moscow), v. 20, no. 12, Dec. 1984 p 1183-1188 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

N86-12704# Joint Publications Research Service, Arlington, Va.
FOLDED STRUCTURES IN CENTRAL INDIAN OCEAN TRENCH Abstract Only
O. V. Levchenko, L. R. Merklin, and Yu. P. Neprochnov *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-008) 16 Aug. 1985 p 10 Transl. into ENGLISH from Geotektonika (Moscow), no. 1, Jan. - Feb. 1985 p 15-23 (For primary document see N86-12697 03-42)
Avail: NTIS HC A04/MF A01

N86-12709# Joint Publications Research Service, Arlington, Va.
STRUCTURE OF SEDIMENTARY COVER AND BASEMENT OF SIERRA LEONE RISE DETERMINED FROM COMMON DEPTH POINT SEISMIC (EQUATORIAL ATLANTIC) Abstract Only
V. I. Kara, K. N. Mamoshina, and A. Ye. Shlezinger *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-008) 16 Aug. 1985 p 14 Transl. into ENGLISH from Geotektonika (Moscow), no. 3, May - Jun. 1985 p 38-49 (For primary document see N86-12697 03-42)
Avail: NTIS HC A04/MF A01

N86-12710# Joint Publications Research Service, Arlington, Va.
TECTONIC STRUCTURE OF SHIRSHOV RIDGE (BERING SEA) Abstract Only
Yu. P. Neprochnov, V. V. Sedov, L. R. Merklin, V. P. Zinkevich, O. V. Levchenko, B. V. Baranov, and G. B. Rudnik *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-008) 16 Aug. 1985 p 15 Transl. into ENGLISH from Geotektonika (Moscow), no. 3, May - Jun. 1985 p 21-37 (For primary document see N86-12697 03-42)
Avail: NTIS HC A04/MF A01

N86-12715# Joint Publications Research Service, Arlington, Va.
NONLINEAR INTERACTION BETWEEN SOLITON AND SHORT WAVES IN IDEAL FLUID Abstract Only
Ye. S. Benilov *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-008) 16 Aug. 1985 p 20 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atm. i Okeana (Moscow), v. 21, no. 4, Apr. 1985 p 417-421 (For primary document see N86-12697 03-42)
Avail: NTIS HC A04/MF A01

N86-12716# Joint Publications Research Service, Arlington, Va.
THE QUESTION OF EARTH EXPANSION AND ITS OCEANIC IMPLICATIONS
Vladimir Neiman *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-008) 16 Aug. 1985 p 21-23 Repr. from Moscow News (Moscow), no. 13 p 10 (For primary document see N86-12697 03-42)
Avail: NTIS HC A04/MF A01

N86-12717# Joint Publications Research Service, Arlington, Va.
KAMCHATKA RADIO TELEMETRIC STATION REGISTERS VOLCANO PULSE Abstract Only
In its USSR Rept.: Earth Sci. (JPRS-UES-85-008) 16 Aug. 1985 p 24 Repr. from TASS (Moscow), v. 5-15 20 May 1985 (For primary document see N86-12697 03-42)
Avail: NTIS HC A04/MF A01

N86-12718# Joint Publications Research Service, Arlington, Va.
LASERS MEASURE DRIFTING MOUNTAINS Abstract Only
In its USSR Rept.: Earth Sci. (JPRS-UES-85-008) 16 Aug. 1985 p 25 Transl. into ENGLISH from TASS (Moscow), no. 0447 GMT, 12 Apr. 1985 (For primary document see N86-12697 03-42)
Avail: NTIS HC A04/MF A01

N86-12720# Joint Publications Research Service, Arlington, Va.
MUON TOMOGRAPHY USED TO STUDY UNDERGROUND ROCK STRUCTURE Abstract Only
A. Alekseyev *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-008) 16 Aug. 1985 p 28 Transl. into ENGLISH from NTR: Probl. i Resheniya (Moscow), 30 Apr. - 13 May 1985 p 6 (For primary document see N86-12697 03-42)
Avail: NTIS HC A04/MF A01

N86-12721# Joint Publications Research Service, Arlington, Va.
UNDERGROUND VOLCANOES DISCOVERED WITH SATELLITE RADAR Abstract Only
In its USSR Rept.: Earth Sci. (JPRS-UES-85-008) 16 Aug. 1985 p 29 Transl. into ENGLISH from Sov. Belorussiya (Minsk), 23 May 1985 p 4 (For primary document see N86-12697 03-42)
Avail: NTIS HC A04/MF A01

N86-12722# Joint Publications Research Service, Arlington, Va.
P-WAVE SPECTRA IN PROBLEM OF DETERMINING DYNAMIC PARAMTERS OF EARTHQUAKE FOCI. STANDARDIZATION OF INITIAL DATA AND PROCEDURES FOR COMPUTING AMPLITUDE SPECTRA Abstract Only
Zh. Ya. Aptekman, S. K. Daragan, D. V. Dolgopolov, A. I. Zakharova, V. M. Zobin, S. Ya. Kogan, O. A. Korchagina, A. G. Moskvina, L. A. Polikarpova, and L. S. Chepkunas *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-008) 16 Aug. 1985 p 30 Transl. into ENGLISH from Vulkanol. i Seysmologiya (Moscow), no. 2, Mar. - Apr. 1985 p 60-70 (For primary document see N86-12697 03-42)
Avail: NTIS HC A04/MF A01

N86-12723# Joint Publications Research Service, Arlington, Va.
PROSPECTS FOR DEVELOPMENT OF SEISMIC PROSPECTING METHODS AND APPARATUS Abstract Only
Yu. V. Timoshin *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-008) 16 Aug. 1985 p 31 Transl. into ENGLISH from Geofiz. Zh. (Kiev), v. 7, no. 2, Mar. - Apr. 1985 p 3-12 (For primary document see N86-12697 03-42)
Avail: NTIS HC A04/MF A01

N86-12725# Joint Publications Research Service, Arlington, Va.
OPTIMAL DENSITY MODEL OF EARTH'S RUST AND UPPER MANTLE ALONG KAMCHATKA-PACIFIC GEOTRAVERSE Abstract Only
M. L. Krasnyy, V. Yu. Kosygin, and V. I. Isayev *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-008) 16 Aug. 1985 p 32-33 Transl. into ENGLISH from Tikhookeanskaya Geol. (Novosibirsk), no. 1, Jan. - Feb. 1985 p 72-84 (For primary document see N86-12697 03-42)
Avail: NTIS HC A04/MF A01

N86-12726# Joint Publications Research Service, Arlington, Va.
VARIATION IN SEISMICITY UNDER INFLUENCE OF LUNAR-SOLAR TIDAL DEFORMATIONS Abstract Only
A. L. Rykunov and V. B. Smirnov *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-008) 16 Aug. 1985 p 33 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Zemli (Moscow), no. 1, Jan. 1985 p 97-103 (For primary document see N86-12697 03-42)
Avail: NTIS HC A04/MF A01

N86-12727# Joint Publications Research Service, Arlington, Va.
ELECTROMAGNETIC EFFECTS IN CRUSTAL FRACTURING Abstract Only
M. B. Gokhberg, I. L. Gufeld, N. I. Gershenzon, and V. A. Pilipenko *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-008) 16 Aug. 1985 p 34 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Zemli (Moscow), no. 1, Jan. 1985 p 72-87 (For primary document see N86-12697 03-42)
Avail: NTIS HC A04/MF A01

N86-12728# Joint Publications Research Service, Arlington, Va.
EXPERIENCE IN BREAKING DOWN GRAVITY FIELD INTO COMPONENTS RESULTING FROM DENSITY HETEROGENEITIES AT VARIOUS DEPTHS (USING NORTH ATLANTIC AND MEDITERRANEAN AS EXAMPLES) Abstract Only
M. Ye. Artemyev, T. M. Babayeva, I. Ye. Voydetskiy, and V. O. Mikhaylov *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-008) 16 Aug. 1985 p 34-35 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Zemli (Moscow), no. 1, Jan. 1985 p 44-52 (For primary document see N86-12697 03-42)
Avail: NTIS HC A04/MF A01

N86-12729# Joint Publications Research Service, Arlington, Va.
HYPOCENTRAL AREAS OF AFTERSHOCKS AND POSSIBLE FAULT SYSTEMS AT FOCI OF TSUNAMI-GENERATING KURIL EARTHQUAKES Abstract Only
S. L. Solovyev and K. A. Kechekezyan *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-008) 16 Aug. 1985 p 35 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Zemli (Moscow), no. 1, Jan. 1985 p 3-15 (For primary document see N86-12697 03-42)
Avail: NTIS HC A04/MF A01

N86-12730# Joint Publications Research Service, Arlington, Va.
METHOD AND RESULTS OF ELECTROMETRIC OBSERVATIONS IN SEISMICALLY ACTIVE REGION Abstract Only
M. G. Ostashevskiy and A. Ya. Sidorin *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-008) 16 Aug. 1985 p 36 Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 282, no. 2, May 1985 p 295-299 (For primary document see N86-12697 03-42)
Avail: NTIS HC A04/MF A01

N86-12731# Joint Publications Research Service, Arlington, Va.
SEISMIC EFFECT OF UNDERGROUND BLASTS AND PROBLEM OF ESTIMATING TOTAL EARTHQUAKE ENERGY Abstract Only
M. A. Sadovskiy, O. K. Kedrov, V. A. Laushkin, and I. L. Pasechnik *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-008) 16 Aug. 1985 p 37 Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 281, no. 4, Apr. 1985 p 825-829 (For primary document see N86-12697 03-42)
Avail: NTIS HC A04/MF A01

N86-12732# Joint Publications Research Service, Arlington, Va.
TECTONICS OF EASTERN KRONOTSKIY PENINSULA AND FORMATIONAL ASSOCIATION OF BASALTS (KAMCHATKA) Abstract Only
Yu. N. Raznitsin, S. A. Khubunaya, and N. V. Tsukanov *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-008) 16 Aug. 1985 p 37-38 Transl. into ENGLISH from Geotektonika (Moscow), no. 1, Jan. - Feb. 1985 p 88-101 (For primary document see N86-12697 03-42)
Avail: NTIS HC A04/MF A01

N86-12733# Joint Publications Research Service, Arlington, Va.
GEODYNAMICS OF CRUSTAL DILATATION IN TRANSITION AREA FROM ASIAN CONTINENT TO PACIFIC OCEAN Abstract Only
V. P. Utkin *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-008) 16 Aug. 1985 p 38 Transl. into NGLISH from Geotektonika (Moscow), no. 1, Jan. - Feb. 1985 p 73-87 (For primary document see N86-12697 03-42)
Avail: NTIS HC A04/MF A01

N86-12735# Joint Publications Research Service, Arlington, Va.
ATMOSPHERIC TURBULENCE INVESTIGATIONS AT TSIMLYANSK SCIENTIFIC STATION, ATMOSPHERIC PHYSICS INSTITUTE, USSR ACADEMY OF SCIENCES Abstract Only
L. R. Tsvang *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-008) 16 Aug. 1985 p 42-43 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atm. i Okeana (Moscow), v. 21, no. 4, Apr. 1985 p 339--348 (For primary document see N86-12697 03-42)
Avail: NTIS HC A04/MF A01

47 METEOROLOGY AND CLIMATOLOGY

Includes weather forecasting and modification.

N86-12907 Illinois Univ., Urbana-Champaign.
THE NUMERICAL SIMULATION OF GEOGRAPHIC STORMS Ph.D. Thesis
Michael Morgan Bradley 1985 272 p
Avail: Univ. Microfilms Order No. DA8511583

Observations of winter storms over the Glamorgan Hills of south Wales confirmed the importance of the seeder-feeder mechanism of orographic recipitation enhancement. A dynamic mountain model was used to investigate the hypothesis that mountain wave effects were responsible for increased wind speed sensitivity. The model, is formulated in terrain following coordinates. In addition to representing convective and stratiform cloud processes, the model can accurately simulate moderately nonlinear mountain waves, and is suitable for studing many aspects of orographic storms. It is shown that orographic clouds significantly alter the airflow over hills and, conversely, that mountain waves strongly influence the moist processes. Wind speed, wind shear, atmospheric stability, and relative humidity are all important factors in the complex scale interactions which occur during orographic storms. The results support the hypothesis that certain mountain wave effects greatly increase the wind speed sensitivity of the Bergeron seeder-feeder mechanism. Dissert. Abstr.

N86-12908*# Colorado State Univ., Fort Collins. Dept. of Atmospheric Science.
GLOBAL VIEW OF THE UPPER LEVEL OUTFLOW PATTERNS ASSOCIATED WITH TROPICAL CYCLONE INTENSITY CHANGES DURING FGGE Final Report
Lianshou Chen (Chinese National Meteorological Bureau) and William M. Gray Oct. 1985 133 p refs
(NASA-CR-174407; NAS 1.26:174407; ISSN-0067-0340; AS-Paper-392) Avail: NTIS HC A07/MF A01 CSCL 04B

The characteristics of the upper tropospheric outflow patterns which occur with tropical cyclone intensification and weakening over all of the global tropical cyclone basins during the year long period of the First GARP Global Experiment (FGGE) are discussed. By intensification is meant the change in the tropical cyclone's maximum wind or central pressure, not the change of the cyclone's outer 1 to 3 deg radius mean wind which we classify as cyclone strength. All the 80 tropical cyclones which existed during the FGGE year are studied. Two-hundred mb wind fields are derived from the analysis of the European Center for Medium Range Weather Forecasting (ECMWF) which makes extensive use of upper tropospheric satellite and aircraft winds. Corresponding satellite cloud pictures from the polar orbiting U.S. Defense Meteorological Satellite Program (DMSP) and other supplementary polar and geostationary satellite data are also used. Author

N86-12909# Meteorological Satellite Center, Tokyo (Japan).
METEOROLOGICAL SATELLITE CENTER TECHNICAL NOTE NO. 11, 1985
Mar. 1985 109 p refs In JAPANESE; ENGLISH summaries (MSC-TN-11; ISSN-0388-9653) Avail: NTIS HC A06/MF A01

Research conducted at the Meteorological Satellite Center in Japan is reported. A case study is presented of the occurrence of linearly ranged Cb-clouds associated with migrating band-shaped cirriform clouds. Clear sky brightness temperature over the north Pacific Ocean is measured with the GMS spacecraft. Brightness temperature differences between GMS-1 and GMS-2 are investigated. The relaying of streteched VISSR data by GMS spacecraft is discussed. Modification of the operational program for GMS-3 is an topic of discussion. An introductory report on the ASDAR (Aircraft to Satellite Data Relay) system is presented. For individual titles, see N86-12910 through N86-12915.

N86-12910# Meteorological Satellite Center, Tokyo (Japan).
OCCURRENCE OF LINEARLY RANGED Cb-CLOUDS ASSOCIATED WITH MIGRATING BAND-SHAPED CIRRIFORM-CLOUDS: A CASE STUDY
Kazufumi Suzuki *In its* Meteorol. Satellite Center Tech. Note, No. 11, 1985 Mar. 1985 p 1-9 refs In JAPANESE; ENGLISH summary (For primary document see N86-12909 03-47)
Avail: NTIS HC A06/MF A01

In the midsummer, linearly ranged Cb-clouds along the southern coast of Japan were often observed in the southwestern leading edge of migrating band-shaped cirriform-clouds. These phenomena (rapidly moving band-shaped cirriform-clouds) are usually related to subsynoptic-scale upper troughs with a weak cold air mass. It is difficult to find out such a weak sub-synoptic-scale upper trough from the conventional data only, however, by tracing the band-shaped cirriform-clouds on the satellite pictures, the trough can be detected easily. Author

N86-12911# Meteorological Satellite Center, Tokyo (Japan).
CLEAR SKY BRIGHTNESS TEMPERATURE OVER THE WESTERN NORTH PACIFIC OCEAN FROM GMS SPACECRAFT
Hideyuki Sasaki *In its* Meteorol. Satellite Center Tech. Note, No. 11, 1985 Mar. 1985 p 11-22 refs In JAPANESE; ENGLISH summary (For primary document see N86-12909 03-47)
Avail: NTIS HC A06/MF A01

An algorithm of extracting clear sky TBB from the radiance histogram in 0.25 deg x 0.25 deg latitude/longitude box of GMS IR data has been prepared and the seasonal features of the TBB in the western north Pacific Ocean have been investigated for about a year from December 1983. The clear sky TBB fluctuates irregularly in comparison with the sea surface temperature of ocean data buoy, which are collected by GMS. The mean success rate of the extraction during the one year is found to be 5 approx. 20% in the area north of 30 deg N, 20 approx. 50% in the area between 10 deg N and 30 deg N, which may correspond to the subtropical high pressure, and 10 to 25% in the zone around 5 deg N, which is associated with the intertropical convergence zone (ITCZ). The magnitude of atmospheric correction, which is defined the difference between the TBB and the ten day mean sea surface temperature which is derived from conventional data, is 4K near Japan in winter and more than 10 K near the ITCZ in summer. Author

N86-12912# Meteorological Satellite Center, Tokyo (Japan).
SIMULTANEOUS OBSERVATION OF GMS AND GMS-2: A STUDY OF THE DIFFERENCE BETWEEN THE BRIGHTNESS TEMPERATURES BY GMS AND THOSE BY GMS-2
Masaaki Togashi, Akinori Ichiki, Taichi Takahashi, and Shuichi Katsuki *In its* Meteorol. Satellite Center Tech. Note, No. 11, 1985 Mar. 1985 p 23-32 refs In JAPANESE; ENGLISH summary (For primary document see N86-12909 03-47)
Avail: NTIS HC A06/MF A01

A simultaneous observation of GMS (160 deg E) and GMS-2 (140 deg E) was conducted on 20th October in 1982. On the basis of the data obtained from this observation at same points along 150 deg E longitude, the difference between the brightness temperatures (TBB's) obtained from two geostationary meteorological satellites was analyzed. As a result it became clear that the average difference of two TBB's derived from 0.2 deg x 0.2 deg areas along 150 deg E longitude was about 1.3 K. Author

N86-12913# Meteorological Satellite Center, Tokyo (Japan).
RELAYING OF THE STRETCHED VISSR DATA BY GMS SPACECRAFT
Takao Suzuki *In its* Meteorol. Satellite Center Tech. Note, No. 11, 1985 Mar. 1985 p 33-42 refs In JAPANESE; ENGLISH summary (For primary document see N86-12909 03-47)
Avail: NTIS HC A06/MF A01

This is the proposal of the streteched VISSR data dissemination method which will enable to relay the VISSR data simultaneously with the VISSR observation. Owing to this effective usage of GMS, hourly VISSR observation will be possible. Summary of the tests conducted at the CDAS is also mentioned in this draft. Author

N86-12914# Meteorological Satellite Center, Tokyo (Japan).
THE MODIFICATION OF THE OPERATIONAL PROGRAM FOR GMS-3
Koichi Kimura and Toshiyuki Kurino *In its* Meteorol. Satellite Center Tech. Note, No. 11, 1985 Mar. 1985 p 43-54 refs In JAPANESE; ENGLISH summary (For primary document see N86-12909 03-47)
Avail: NTIS HC A06/MF A01

GMS-3 was launched in August, 1984 to contribute to improve meteorological service, succeeding to GMS/GMS-2. This report describes the modifications of the softwares in Meteorological Satellite Center in preparation for above satellite change. Before entering the main subject, the outlines of telemetry command processing and HK processing are described. Author

N86-12915# Meteorological Satellite Center, Tokyo (Japan).
INTRODUCTION TO OPERATIONAL ASDAR SYSTEM
Michio Hitani *In its* Meteorol. Satellite Center Tech. Note, No. 11, 1985 Mar. 1985 p 55-60 refs In JAPANESE; ENGLISH summary (For primary document see N86-12909 03-47)
Avail: NTIS HC A06/MF A01

ASDAR (Aircraft to Satellite Data Relay) is the meteorological avionics systems which automatically sample, record and transmit meteorological observations. The operational ASDAR unit transmits additional information compared with the prototype unit which has continued to function still in service. The initial deliveries of the new flight units are expected dy mid-1985. The data collection system will be revised to process the new ASDAR data. Author

N86-12916*# Wisconsin Univ., Milwaukee. Dept. of Geological/Geophysical Sciences.
LARGE-SCALE CIRCULATION DEPARTURES RELATED TO WET EPISODES IN NORTHEAST BRAZIL Final Report
Dhirendra N. Sikdar and James B. Elsner Oct. 1985 70 p refs (Grant NAG5-384)
(NASA-CR-176352; NAS 1.26:176352) Avail: NTIS HC A04/MF A01 CSCL 04B

Large scale circulation features are presented as related to wet spells over northeast Brazil (Nordeste) during the rainy season (March and April) of 1979. The rainy season season is devided into dry and wet periods, the FGGE and geostationary satellite data was averaged and mean and departure fields of basic variables and cloudiness were studied. Analysis of seasonal mean circulation features show: lowest sea level easterlies beneath upper level westerlies; weak meridional winds; high relative humidity over the Amazon basin and relatively dry conditions over the South Atlantic Ocean. A fluctuation was found in the large scale circulation features on time scales of a few weeks or so over Nordeste and the South Atlantic sector. Even the subtropical High SLP's have large departures during wet episodes, implying a short period oscillation in the Southern Hemisphere Hadley circulation. Author

N86-12917*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
ATMOSPHERIC ENVIRONMENT FOR SPACE SHUTTLE

(STS-51B) LAUNCH
G. L. Jasper, D. L. Johnson, C. K. Hill, and G. W. Batts (Computer Sciences Corp., Huntsville, Ala.) Jul. 1985 45 p refs
(NASA-TM-86525; NAS 1.15:86525) Avail: NTIS HC A03/MF A01 CSCL 04B

A summary of selected atmospheric conditions observed near space shuttle STS-51B launch time on April 29, 1985, at Kennedy Space Center Florida is presented. Values of ambient pressure, temperature, moisture, ground winds, visual observations (cloud), and winds aloft are included. The sequence of prelaunch Jimsphere measured vertical wind profiles is given. The final atmospheric tape, which consists of wind and thermodynamic parameters versus altitude, for STS-51B vehicle ascent was constructed. The STS-51B ascent atmospheric data tape was constructed by Marshall Space Flight Center's Atmospheric Sciences Division to provide an internally consistent data set for use in post flight performance assessments. Author

N86-12918*# Pennsylvania State Univ., University Park. Dept. of Meteorology.
THE NATURE OF SYMMETRIC INSTABILITY AND ITS SIMILARITY TO CONVECTIVE AND INERTIAL INSTABILITY Contractor Report, 1 Jul. 1980 - 31 Mar. 1985
Quin Xu and J. H. E. Clark Washington NASA Oct. 1985 30 p refs
(Contract NAS8-33797)
(NASA-CR-3945; NAS 1.26:3945) Avail: NTIS HC A03/MF A01 CSCL 04B

It is shown that there exists a local similarity among SI (Symmetric Instability), BI (Buoyancy or Convective Instability), and II (Inertial Instability) even for fully nonlinear viscous motion. The most unstable slope angles for SI and Moist SI motions are analyzed based on parcel energetics. These considerations also suggest qualitatively that CSI (Conditional SI) circulations will be slantwise and lie between the moist most unstable slope and dry least stable slope of the basic state. Author

N86-12919*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
ADVANCED MOISTURE AND TEMPERATURE SOUNDER (AMTS) BASELINE 5 STUDY REPORT
Nathan L. Evans, Jr. and Valerie G. Wright 15 Sep. 1985 437 p
(Contract NAS7-918)
(NASA-CR-176331; JPL-Pub-85-61; NAS 1.26:176331) Avail: NTIS HC A19/MF A01 CSCL 04B

An Advanced Moisture and Temperature Sounder (AMTS) passive infrared atmospheric sounding system is described. Instrument requirements are developed. Parametric and scaling equations for a grating spectrometer instrument approach are developed which define detector noise limited performance in terms of instrument, orbit, and spatial coverage parameters. Instrument design criteria are developed and a baseline instrument design is presented. Error sources are identified and corresponding system error component values are estimated. Within narrow limits, the highest level of performance achievable with a stand alone infrared sounder using current state of the art technology is established. Additional trade offs necessary to establish a reasonably optimal system design in terms of performance, cost, and risk are identified. Author

N86-12920# Massachusetts Inst. of Tech., Lexington.
WEATHER RADAR STUDIES Quarterly Technical Summary Report, 1 Oct. - 31 Dec. 1984
J. E. Evans 31 Dec. 1984 48 p
(Contract DTFA-01-80-Y-10546)
(AD-A157093; FAA-PM-85-09) Avail: NTIS HC A03/MF A01 CSCL 04/2

THe test-bed Doppler weather radar integration testing continued in Olive Branch, Mississippi after the lightning strike damage was repaired. Preliminary tests indicate that the objective of 50-dB clutter suppression is being obtained in the field and that the system sensitivity is very close to the NEXRAD specification. Installation of an improved lightning protection system neared completion. The Lincoln mesonet continued to obtain useful data throughout October and November. A strong microburst with peak winds so 68 mph was recorded in the immediate vicinity of Memphis International Airport on 20 October. The mesonet and LLWSAS data from Memphis, and Doppler weather radar data from the National Center for Atmospheric Research JAWS program and the National Severe Storms Laboratory, are being analyzed to develop low-altitude wind shear detection algorithms. Clutter measurements were carried out at Eglin Air Force Base/Ft. Walton Beach Airport, the Memphis Airport, and the Olive Branch, Mississippi test site. Work continued on the development of weather radar products for the Central Weather Processor. This work focused on tracker refinement studies and NEXRAD-compatible processing of the existing reflectivity-only weather radars. GRA

N86-12921# Naval Postgraduate School, Monterey, Calif.
WEATHER ANALYSIS PROGRAMS USING HP-41CV Technical Report, Oct. 1983 - Sep. 1984
C. H. Wash and L. A. Spray Nov. 1984 44 p
(AD-A157389; NPS63-84-008) Avail: NTIS HC A03/MF A01 CSCL 04/2

Several synoptic problems, previously solved by graphical overlays, can be solved with a programmable calculator. The HP-41CV hand-held calculator is used to determine surface winds, the probability of average rainfall for a regional area (Monterey, California), contrail formation, and the lifting condensation level from surface data. GRA

N86-12922*# Naval Postgraduate School, Monterey, Calif.
OBSERVATIONAL-NUMERICAL STUDY OF MARITIME EXTRATROPICAL CYCLONES USING FGGE (FIRST GARP GLOBAL EXPERIMENT) DATA Final Report, Jun. 1982 - May 1985
R. L. Elsberry, C. H. Wash, C. S. Liou, and J. E. Peak May 1985 42 p
(NASA Order S-10663-C)
(NASA-CR-176297; NAS 1.26:176297; AD-A157390; NPS63-85-001) Avail: NTIS HC A03/MF A01 CSCL 04B

Analyses of First GARP Global Experiment (FGGE) data have been used to study three cases of maritime extratropical cyclone development. It has been demonstrated that these FGGE analyses are consistent with the observations through synoptic comparisons and satellite interpretations. Quasi-Lagrangian diagnostic budgets of mass, vorticity, angular momentum and heat have been computed in pressure coordinates for observed and model-generated cyclones. The roles of jet streaks and small static stability in the lower troposphere during rapid development of maritime cyclones have been documented. Vertical circulation trends in the mass budget are consistent with the sea-level pressure evolution in each case. Inward transport of vorticity due to the jet streak coincides with the rapid development phase. Vorticity budgets of these maritime cyclones appear to be consistent with earlier studies of continental cyclones. To complement the observational studies, similar diagnostic studies have been done for numerical simulations of maritime cyclogenesis under straight upper-level flow. These studies demonstrate that similar physical mechanisms are involved in the simulated storms as were found in the FGGE-based studies. Two sets of numerical model predictions from the FGGE analyses were examined for an explosively deepening cyclone over the western North Pacific Ocean. Both models predicted the most rapid deepening phase too early and resulted in too low sea-level pressures. GRA

N86-12923# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
STATISTICAL EVALUATION OF FORECASTS OVER THE LOW-LATITUDES M.S. Thesis
C. P. Zelzer Aug. 1985 82 p
(AD-A157926) Avail: NTIS HC A05/MF A01 CSCL 04/2

A series of experiments, designed to study single level predictions with a barotropic and a primitive equation model has been carried out for 15 June to 15 September 1979 utilizing FGGE (First GARP Global Experiment) data sets. The level chosen for this study is 700 mb with two separate domains being covered. Domain 1 covered a region from 75 W and 20 S to 40 N, while

Domain 2 covered a region from 75 W to 30 W and 20 S to 45 N. This study includes a discussion of tropical storm Claudette and also an analysis of the predictions using root mean square vector wind errors and absolute correlations. The results of 93 experiments show that the simple model based on the conservation of vorticity performs worse than persistence for all time periods in Domain 1 and 2. The model based on the conservation of potential vorticity performs better than persistance for up to one day in Domain 1, and up to 4 days in Domain 2. Past experiments and performance are compared. These included the following regions: the Atlantic and West Africa during the northern summer; a region including the Indian Ocean, Indonesia and the central Pacific Ocean during the northern winter; and a similar region during the northern summer. In general, useful skill of all the regions considered is exhibited only over the following: Central America and South America during northern summer to 4 days, West Africa and eastern Atlantic during northern summer to 4 days, central Pacific Ocean during northern winter to 1 day. GRA

N86-12924# Manchester Univ. (England). Dept. of Physics.
RADIATION FOG MODELING Interim Status Report
J. Latham Sep. 1981 8 p
(Contract DAJA37-81-C-0746)
(AD-A157971; ISR-1) Avail: NTIS HC A02/MF A01 CSCL 04/2

The radiation fog model is being developed in an attempt to predict the initiation, development and characteristics of these fogs. The model is primarily based upon three important processes which interact to determine whether a fog will form in preference to haze development and what characteristics and fluctuations are likely to occur if a fog does form. These processes are: (1) radiative exchanges; (2) droplet growth and CCN spectra; and (3) turbulence characteristics. The exact nature of these interactions is poorly understood and consequently have not yet been fully included in existing models. To date, therefore, accurate simulation of all fog characteristics on various temporal and spatial scales has not been achieved. Data from recent field studies, especially Meppen, have produced results which will enable not only the model to be fully tested, but also greatly assist in the understanding of radiation fog, which will in turn allow more accurate and detailed models to be developed. GRA

N86-12925# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
SQUALL AND CLOUD LINES AS STRUCTURAL COMPONENTS OF AN ARABIAN SEA CONVECTIVE CLOUD CLUSTER M.S. Thesis
C. L. Benson, Jr. 1985 101 p
(AD-A157973; AFIT/CI/NR-85-83T) Avail: NTIS HC A06/MF A01 CSCL 04/2

This research has several objectives. First, it attempts to present a description of the kinematic, thermal, and cloud structure of an eastern Arabian Sea convective cloud cluster. Secondly, this research will determine the horizontal location of updrafts, downdrafts, and gust fronts in relation to observed convection. The last objective is to determine the extent of boundary layer modification by convective. Careful study of all available data revealed several squall lines (as well as other types of convective) embedded in the larger scale cloud cluster. Numerous differences were observed between the squall lines examined in this study and squall lines observed during the Global Atmospheric Research Program's Atlantic Tropical Experiments (GATE). The main differences include: Arabian Sea squall lines were quasi-stationary. while GATE squall lines were moving; Arabian Sea squall lines existed in a more highly sheared environment than GATE squall lines were moving; Arabian Sea squall lines existed in a more highly sheared environmental than GATE convection; the low-level inflow air in Arabian Sea squall lines could be influenced by subsidence from a trailing anvil cloud, while GATE convection's low-level inflow generally was not. This thesis shows exclusively that boundary layer influences caused by convection over the Arabian Sea must be considered when attempting to describe (either qualitatively or numerically) Indian southwest monsoonal rainfall. GRA

N86-12926# Coastal Engineering Research Center, Vicksburg, Miss.
ANNUAL DATA SUMMARY FOR 1981 CERC (COASTAL ENGINEERING RESEARCH CENTER) FIELD RESEARCH FACILITY Final Technical Report
H. C. Miller, W. E. Grogg, Jr., J. R. Rottier, M. W. Leffler, and C. R. Townsend, III Jun. 1985 262 p
(AD-A158143) Avail: NTIS HC A12/MF A01 CSCL 04/2

The annual data summary for CERC (Coastal Engineering Research Center) field research facility discusses the following topics: climatological summary: climate, waves, nearshore currents, tides and water level changes, sediment size, and bathymetry; instrumentation: wave gages, tide gages, and meteorological instruments; data collection and analysis techniques: digital wave data, tide and water level data, meteorological data, visual observations, bathymetric and pier surveys, and sediment data, photographic data; and data availability and results: meteorological data, wave data, current data, tide and water level data, water characteristics, survey data, sediment data, and photography. Author

N86-12927# National Environmental Satellite Service, Washington, D. C. Assessment and Information Services Center.
COMPARISON OF BOUNDARY LAYER WINDS FROM NWS LFM (NATIONAL WEATHER SERVICE'S LIMITED-AREA FINE-MESH) OUTPUT AND INSTRUMENTED BUOYS
R. W. Reeves and P. J. Pytlowany May 1985 51 p
(PB85-226439; NOAA-TM-NESDIS-AISC-2) Avail: NTIS HC A04/MF A01 CSCL 08C

Measurements of the surface wind by 15 instrumented buoys are compared with boundary layer winds predicted by the National Weather Service's (NWS) Limited-area Fine-mesh Model (LFM). The buoy observations at 0600 GMT and 1800 GMT are selected and compared directly to the 6-hour LFM predictions for the nearest grid point; the predictions are made twice-daily and are valid for those times. The LFM 12-hourly distributions are skewed toward higher speeds relative to the observations, but the direction distributions show very good agreement, suggesting the usefulness of the LFM data base to construct climatologies. GRA

N86-12928# Arizona Univ., Tucson. Dept. of Hydrology and Wate Resources.
EVALUATION OF THE NWS (NATIONAL WEATHER SERVICE) SOIL MOISUTRE ACCOUNTING MODEL FOR AUTOMATED FLASH FLOOD FORECASTING IN SMALL ARID AND SEMI-ARID WATERSHEDS Report, 1983-1984
S. Sorooshian 1985 45 p Prepared in cooperation with Arizona Water Resources Research Center
(PB85-229722; USGS/G-828-08) Avail: NTIS HC A03/MF A01

An analysis of the NWS model and the hydrological characteristics of small arid watersheds indicated that modifications to the model would be necessary for arid zone applications. One modification, based on the absence or insigificance of base-flow in the typical small, arid watershed, involves removal of the lower zone reservoirs and replacement of the complex percolation function by a proportional loss rate. In light of the extreme rainfall intensities and rapid runoff rates associated with desert floods, the infiltratioin representation was revised so that overland flow may begin before the upper zone is saturated and so that maximum infiltration capacity is a parameter. Other modifications include the use of watershed subcells and routing which simulates percolation of flows into the channel bed. The amount of data required for model calibration can be reduced by the use of the modified model in conjunction with recommended calibration procedures. GRA

N86-12929# National Oceanic and Atmospheric Administration, Boulder, Colo. Environmental Sciences Group.
FIRST EXPERIMENT IN FORECASTING COOL-SEASON WEATHER WITH THE PROFS SYSTEM
P. Schultz, M. C. McCoy, R. E. McGowan, T. W. Schlatter, and J. S. Wakefield Apr. 1985 32 p
(PB85-230605; NOAA-TM-ERL-EST-16) Avail: NTIS

HC A03/MF A01 CSCL 04B

The Program for Regional Observing and Forecasting Services (PROFS) conducted a winter weather forecasting exercise from February through April of 1984. This was PROFS' first attempt at applying advanced data processing and display technologies to winter weather forecasting problems. Eleven events were forecast. The primary objective of the exercise was to introduce the PROFS staff and the local contingent of meteorologists to winter weather forecasting and procedures. The emphasis was on understanding some of the mesoscale aspects of winter weather and not on maximizing the accuracy of the forecasts. In addition to conventional satellite, rawinsonde, and surface data, the forecasters had access to data from the PROFS mesonet and from the Colorado wind profiling system. GRA

N86-12930# National Weather Service, Salt Lake City, Utah.

ANNUAL DATA AND VERIFICATION TABULATION EASTERN NORTH PACIFIC TROPICAL STORMS AND HURRICANES, 1984

E. B. Gunther and R. L. Cross Apr. 1985 32 p Prepared in cooperation with Eastern Pacific Hurricane Center, San Francisco, Calif.

(PB85-187888; NOAA-TM-NWS-WR-189) Avail: NTIS HC A03/MF A01 CSCL 04B

Eastern north Pacific tropical cyclone activity is discussed. Tropical cyclone prediction models used by Eastern Pacific Hurricane Center (EPHC) forecasters are included. Verification statistics for the 1964 season are shown. Best track, operational positions, and position errors are also included. GRA

N86-12931# National Oceanic and Atmospheric Administration, Boulder, Colo. Environmental Sciences Group.

MESOSCALE CONVECTIVE SYSTEMS: A SATELLITE-DATA-BASED CLIMATOLOGY

D. L. Bartels, J. M. Skradski, and R. D. Menard Dec. 1984 65 p refs

(PB85-186862; NOAA-TM-ERL-ESG-8) Avail: NTIS HC A04/MF A01 CSCL 04B

The occurrence of significant mesoscale Convective Systems (MCSs) over the central United States during April through July is established on the basis of satellite imagery. Track figures for previously documented 1978 to 1982 Mesoscale Convective Complexes (MCCs), as well as smaller cloud clusters and convective lines that occurred during 1979 to 1983, are presented. Other climatological attributes, including diurnal characteristics and average durations, are extracted from a tabular documentation of more than 500 mesosystems. This satellite-data-based climatology of convective weather systems may be used, in conjunction with climatologies of severe thunderstorms, as a research resource to help to improve the authors understanding of central United States convective weather. GRA

N86-12932# National Weather Service, Garden City, N.Y.

COMPARISON AMONG VARIOUS THERMODYNAMIC PARAMETERS FOR THE PREDICTION OF CONVECTIVE ACTIVITY

H. M. Stone Apr. 1985 19 p refs

(PB85-208217; NOAA-TM-NWS-ER-68) Avail: NTIS HC A02/MF A01 CSCL 04B

The development of convection requires a sufficient moisture source, unstable air, and a triggering mechanism. The authors are concerned here only with the effect of atmospheric instability on convection. A variety of different stability indices are now in use, the most recent of these being the energy indices, EI1 and EI2. The performance of the lifted, K, Showalter, EI1 and EI2 stability indices was investigated. In addition to the investigation of the performance of the various stability indices, correlation between the heights of radar tops and occurrence of severe weather were also examined. Correlation coefficients were computed for radar top heights above ground level, above tropopause level, and above equillibrium level. GRA

N86-12933# Environmental Protection Agency, Research Triangle Park, N.C. Atmospheric Sciences Research Lab.

MODELING THE DIURNAL VARIATION OF METEORLOGICAL VARIABLES WITHIN THE BOUNDARY LAYER: PRELIMINARY COMPARISON RESULTS

J. S. Irwin May 1985 28 p refs

(PB85-198349; EPA-600/D-85/097) Avail: NTIS HC A03/MF A01 CSCL 04B

Mean monthly patterns of the diurnal variation of the wind, temperature and turbulence over the lower 300 m are computed, using data collected on the 365 m WJBF-TV meteorological mast located 11 km southeast of Augusta, Georgia. A review is presented of the seasonal variations observed in these patterns for the five-year period from 1975 through 1979. Clearly evident were the seasonal variations in the 10-m values of wind and temperature. Little seasonal variation was evident in the diurnal profiles of turbulence. Comparison results are presented of the diurnal patterns for June 1976 simulated by a meteorological processor using as input the hourly National Weather Service reports form Augusta and twice-daily radiosonde reports from Athens, Georgia. GRA

N86-12934# National Weather Service, Garden City, N.Y.

CORRELATION AND REGRESSION EQUATION PROGRAM REGRS

H. M. Stone May 1985 34 p

(PB85-213353; NOAA-NWS-ERCP-31) Avail: NTIS HC A03/MF A01 CSCL 04B

In focal research studies, there is frequently a need to compute correlation coefficients between some variable, which is to be predicted, and various other variables which may serve as predictors. After an appropriate data base has been collected, this program computes linear correlation coefficients between the dependent variable to be predicted and all the possible predictor variables, and also computes a multiple correlation coefficient using all the predictor variables together and partial correlations for each of the predictors. In addition, a linear regression equation is obtained relating the predictors to the dependent variable. The program also has the capability of going through a screening process, whereby one variable at a time is dropped from the regression equation, eliminating those with lowest partial correlation coefficients first, until only one predictor variable remains. Author (GRA)

N86-12935# National Weather Service, Garden City, N.Y.

SCATTER DIAGRAM AND HISTOGRAM PROGRAM - SCATR

H. M. Stone May 1985 41 p

(PB85-213346; NOAA-NWS-ERCP-32) Avail: NTIS HC A03/MF A01 CSCL 04B

One of the laborious tasks usually required for statistical studies is the plotting of scatter diagrams and frequency histograms. These two types of displays are usually needed to visualize the relationship between two or more variables and they usually provide more useful information than a table of correlation coefficients between the variables. For example, such a diagram may reveal a good relationship between some variables over a limited range of the data, while correlation coefficients computed over the full range may indicate a poor relationship. All the conclusion of the research study considerable labor must usually be devoted to drafting finished figures of this type for publication. The preparation of these diagrams has now been automated by the program SCATR, which creates them as an AFOS graphic product. The size and dimensions of the graphic are specified by the user, so that the final product is suitable for publication. Author (GRA)

N86-12936# National Weather Service, Silver Spring, Md. Techniques Development Lab.

OBJECTIVE MAP ANALYSIS FOR THE LOCAL AFOS MOS (AUTOMATION OF FIELD OPERATIONS AND SERVICES MODEL OUTPUT STATISTICS) PROGRAM

H. R. Glahn, T. L. Chambers, W. S. Richardson, and H. P. Perrotti Mar. 1985 41 p

(PB85-212884; NOAA-TM-NWS-TDL-75) Avail: NTIS HC A03/MF A01 CSCL 04B

A computer program was developed which can be used to

analyze either spatially continuous or discontinuous hydrometeorological data. It is being used extensively in the development of a local MOS capability, and has been specifically turned for the analysis of 13 meteorological variables. The Cressman successive correction procedure, used for continuous fields, and the nearest neighbor procedure, used for discontinuous fields, and their implementation in the computer program are discussed. Control parameters and options are discussed, and several examples are presented. GRA

N86-12937# National Weather Service, Washington, D.C. Climate Analysis Center.
MONTHLY AND SEASONAL WEATHER OUTLOOK FOR MID-MAY TO MID-JUNE 1985, VOLUME 39, NUMBER 10, MAY 14, 1985
14 May 1985 10 p
(PB85-204261) Avail: NTIS HC A02/MF A01 CSCL 04B

The report describes weather observations for marine areas. Articles included are: comparison between ship and buoy climatologies; and Great Lakes navigation season, 1983; Marine observation programs; tips to the radio officer; and Marine weather review. GRA

N86-12631# Joint Publications Research Service, Arlington, Va.
METEOROLOGICAL CENTER'S FORECASTS AID VENUS PROBE TRACKING Abstract Only
M. Dmitruk *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 1 Transl. into ENGLISH from Sots. Ind. (Moscow), 23 Mar. 1985 p 3 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

N86-12632# Joint Publications Research Service, Arlington, Va.
DIAGNOSIS OF WEATHER STATES IN WINTER OF 1980-1981 Abstract Only
G. P. Kurbatkin *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 2 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atm. i Okeana (Moscow), v. 20, no. 11, Nov. 1984 p 1011-1016 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

N86-12633# Joint Publications Research Service, Arlington, Va.
MAIN PROBLEMS IN CLIMATE MONITORING (DIAGNOSIS) Abstract Only
G. V. Gruza, K. G. Rubinshteyn, B. A. Birman, and V. N. Razuvayev *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 2 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atm. i Okeana (Moscow), v. 20, no. 11, Nov. 1984 p 1017-1026 Original language document was announced in IAA as A85-17976 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

N86-12634# Joint Publications Research Service, Arlington, Va.
USE OF METHOD OF CANONICAL CORRELATIONS FOR ANALYSIS OF CLIMATIC SERIES Abstract Only
M. S. Tatarskaya and M. I. Fortus *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 3 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atm. i Okeana (Moscow), v. 20, no. 11, Nov. 1984 p 1027-1034 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

N86-12635# Joint Publications Research Service, Arlington, Va.
EMPIRICAL ANALYSIS OF DIRECT AND INVERSE RELATIONSHIPS BETWEEN MACROSCALE CHARACTERISTICS OF ATMOSPHERIC PROCESSES IN NORTHERN HEMISPHERE AND THERMAL STATE OF NORTH ATLANTIC Abstract Only
M. I. Yudin, V. M. Mirvis, and I. Ye. Chuvashina *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 3-4 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atm. i Okeana (Moscow), v. 20, no. 11, Nov. 1984 p 1035-1041 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

N86-12636# Joint Publications Research Service, Arlington, Va.
ATMOSPHERIC AEROSOL AND ITS EFFECTS ON CLIMATE Abstract Only
K. Ya. Kondratyev and M. A. Prokofyev *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 4-5 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atm. i Okeana (Moscow), v. 20, no. 11, Nov. 1984 p 1055-1063 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

N86-12637# Joint Publications Research Service, Arlington, Va.
INFLUENCE OF POWER ENGINEERING ON CLIMATE Abstract Only
V. A. Legasov, I. I. Kuzmin, and A. N. Chernoplekov *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 6 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atm. i Okeana (Moscow), v. 20, no 11, Nov. 1984 p 1089-1103 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

N86-12638# Joint Publications Research Service, Arlington, Va.
RECENT CHANGES IN CLIMATE AND WORLD WATER BALANCE Abstract Only
S. G. Dobrovolskiy and R. K. Klinge *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 6 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Ser. Geogr. (Moscow), no. 1, Jan. - Feb. 1985 p 31-38 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

N86-12639# Joint Publications Research Service, Arlington, Va.
CLIMATICALLY ACTIVE TRACE GASES IN ATMOSPHERE Abstract Only
I. L. Karol *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 5 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atm. i Okeana (Moscow), v. 20, no. 11, Nov. 1984 p 1064-1074 Original language document was announced in IAA as A85-17981 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

N86-12640# Joint Publications Research Service, Arlington, Va.
ESTIMATE OF RADIATION-CLIMATIC EFFECTS OF NATURAL AND ANTHROPOGENIC AEROSOL Abstract Only
N. I. Manuylova, V. K. Petukhov, T. A. Tarasova, and Ye. M. Feygelson *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 5 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atm. i Okeana (Moscow), v. 20, no. 11, Nov. 1984 p 1075-1080 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

N86-12698# Joint Publications Research Service, Arlington, Va.
SOME RESULTS OF STUDY OF BLOCKING LAYERS ON DAYS WITH VERTICALLY DEVELOPED CLOUD COVER OF CAUCASUS-CASPIAN REGION ON BASIS OF AEROSPACE INFORMATION Abstract Only
A. A. Gorchiyev and T. D. Agayev *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-008) 16 Aug. 1985 p 1 Transl. into ENGLISH from Izv. Akad. Nauk Azerbaydzhanskoy SSR, Ser. Nauki o Zemle (USSR), no 6, 1984 p 111-118 (For primary document see N86-12697 03-42)
Avail: NTIS HC A04/MF A01

N86-12736# Joint Publications Research Service, Arlington, Va.
HUMIDITY PROFILE MESUREMENTS IN ATMOSPHERIC LOWER LAYER BY SPONTANEOUS RAMAN SCATTERING METHOD Abstract Only
O. A. Bukin, S. Yu. Stolyarchuk, and V. A. Tyapkin *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-008) 16 Aug. 1985 p 43-44 Transl. into ENGLISH from Zh. Prikl. Spektroskopii (Minsk), v. 42, no. 4, Apr. 1985 p 631-636 Original language document was announced in IAA as A85-38572 (For primary document see N86-12697 03-42)
Avail: NTIS HC A04/MF A01

N86-12737# Joint Publications Research Service, Arlington, Va.
SOME CHARACTERISTICS OF TRANSMISSION BY THIN CLOUDS IN VISIBLE AND INFRARED SPECTRAL REGIONS Abstract Only
Yu. S. Georgiyevskiy and A. Kh. Shukurov *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-008) 16 Aug. 1985 p 44-45 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atm. i Okeana (Moscow), v. 21, no. 4, Apr. 1985 p 397-402 (For primary document see N86-12697 03-42)
Avail: NTIS HC A04/MF A01

48 OCEANOGRAPHY

Includes biological, dynamic and physical oceanography; and marine resources.

N86-12938 Michigan Univ., Ann Arbor.
WAVE-CURRENT AND WAVE-TOPOGRAPHIC INTERACTIONS USING SEASAT SYNTHETIC APERTURE RADAR OBSERVATIONS AND ANALYTICAL OCEAN MODELS Ph.D. Thesis
Yun-Chi Tseng 1985 205 p
Avail: Univ. Microfilms Order No. DA8512527

This dissertation investigates the capability of SEASAT synthetic aperture radar (SAR) to detect wave-current and wave-topographic interactions in the Gulf Stream area by analyzing the refracted wave directions obtained from different methods. Four study methods have been employed: the optical Fourier transform (OFT), the fast Fourier transform (FFT), the kinematical, and the dynamical methods. The first two methods were applied to analyze the SAR data for estimating the dominant wave directions. The last two methods were applied to calculate the refracted wave directions for comparison with those measured by the OFT and FFT analyses. General theories of wavecurrent and wave-topographic interactions were formulated by assuming the ocean waves to be linear and steady-state. The SAR data from Rev. 0974 on September 3, 1978 over the Gulf Stream off Cape Hatteras, N.C. were utilized. Some 49 study positions located within this study area were chosen for this investigation. Results showed that the refracted wave directions obtained from the analyses of SAR data, from both the OFT and FFT methods, were in reasonable agreement with those obtained from kinematical and dynamical methods. Dissert. Abstr.

N86-12939 Harvard Univ., Cambridge, Mass.
FLOW RATES IN THE EAST PACIFIC RISE (21 DEG N) HOT SPRINGS, AND NUMERICAL INVESTIGATIONS OF TWO REGIMES OF HYDROTHERMAL CIRCULATION Ph.D. Thesis
David Rhys Converse 1985 473 p
Avail: Univ. Microfilms Order No. DA8510197

Flow rates of 0.7 to 2.4 m/s were measured in the hot springs on the East Pacific Rise (21 deg N). It is estimated that the Southwest, National Geographic, and the OBS vents collectively discharge 2 x 1 10 to the 8th power watts and 150 kg H2O/s. The rate of heat transport exceeds the steady-state rate of heat input to the ridge system. The lifetimes of hot springs can not exceed 40,000 years because of the limited heat supply. Mechanical or chemical clogging of the flow routes may shorten these lifetimes significantly. It is predicted that less than 3% of the sulfide particle debouched by the hot springs settle near the vents. Large massive sulfide deposits (ex. Mavrouni) must form under different conditions. A new model of the time-averaged transfer of heat and momentum predicts the linear variation of Nusselt number and root-mean-square velocity with Rayleigh number observed in numerical experiments of two-dimensional convection in a homogeneous porous medium with a closed top. Dissert. Abstr.

N86-12940 Northwestern Univ., Evanston, Ill.
MOTION OF THE PACIFIC PLATE RELATIVE TO THE HOTSPOTS SINCE THE JURASSIC AND MODEL OF OCEANIC PLATEAUS OF THE FARALLON PLATE Ph.D. Thesis
Laurel Jean Henderson 1985 329 p
Avail: Univ. Microfilms Order No. DA8511827

A model of the motion since the Jurassic of the Pacific plate relative to the hotspots predicts the formation of nearly all the midplate and excess on-rise volcanism of the Pacific plate. All the aseismic ridges, seamount chains, and even the hitherto unexplained oceanic plateaus of the Pacific plate were produced by hotspots that remained nearly stationary relative to each other. During late Jurassic and Cretaceous time (ca. 155 to 80 Ma) the Pacific plate oceanic plateaus were produced by still-active hotspots that were located near the risecrest surrounding the Pacific plate. This model uses several newly proposed hotspots, which have tracks that are visible on maps of residual depth and gravity anomalies, but have no known active volcanos. Edifices formed near the risecrests on the Pacific plate were likely to have had counterparts on the Farallon and Kula plates. It is proposed that an Early Cretaceous aseismio-ridge of the Farallon plate was subducted beneath the United States Cordillera during the Laramide orogeny. Dissert. Abstr.

N86-12941# SACLANT ASW Research Center, La Spezia (Italy).
SACLANTCEN'S USE OF SCUBA DIVING IN OCEANOGRAPHIC AND ACOUSTIC RESEARCH
F. deStrobel, T. Akal, and O. F. Hastrup 15 Dec. 1984 20 p Original contains color illustrations
(AD-A156714; SACLANTCEN-SM-175) Avail: NTIS HC A02/MF A01 CSCL 05/9

Over 10 years of scientific diving for oceanographic and acoustics research is described. Examples show the need for a scientist to dive even in highly automated activities. Diving operations in oceanographic research have included: deployment of oceanographic buoys and sensors, check-and-recovery operations, installation of bottom-mounted systems, placing fluorescent dye releasers for oceanographic investigations, in situ calibration of neutrally buoyant floats, and evaluations of low-speed towed bodies. Diving operations in underwater acoustics research have included: visual and stereophotographic investigations and sampling of the sea floor and in situ measurements of the acoustic characteristics of sediments using geophones and electroacoustic transducers. These operations and techniques are described and some reference is given to organization, safety rules, and operational limits. GRA

N86-12942# SACLANT ASW Research Center, La Spezia (Italy).
TEMPORAL AND SPATIAL VARIABILITIES IN SHALLOW WATER ACOUSTICS: MEASUREMENTS AND PREDICTIONS
H. B. Ali, M. C. Ferla, and T. Akal 15 Mar. 1985 14 p
(AD-A156718; SACLANTCEN-SM-178) Avail: NTIS HC A02/MF A01 CSCL 20/1

An acoustic signal propagating in the sea is generally degraded not only by interactions with the bottom and surface boundaries, but also by volume inhomogeneities caused by non-uniformities in temperature, density, and salinity distributions. The degradations in the acoustical signal are manifested by fluctuations in its amplitude and phase and by an accompanying loss in its coherence properties. The results of experiments conducted in a shallow water area of the Mediterranean are used to establish correlations between fluctuations in acoustic transmission loss and variability in the environmental parameters. The physical processes responsible for the observed fluctuations are identified primarily with inertial effects, semidiurnal tides, and fine-structure. Using a modified version of SNAP (SACLANTCEN Normal Mode Acoustic Propagation Model) comparisons are made between measured and predicted acoustic transmission loss. GRA

N86-12943# SACLANT ASW Research Center, La Spezia (Italy).
UNDERWATER PHOTOGRAPHY FOR QUANTITATIVE DESCRIPTION OF BOTTOM ROUGHNESS
T. Akal 1 Apr. 1985 21 p
(AD-A156753; SACLANTCEN-SR-87) Avail: NTIS HC A02/MF A01 CSCL 08/10

Knowledge of the roughness of the sea floor is obviously of great importance in marine geology for understanding the processes of the ocean bottom, and in underwater acoustics for

understanding acoustics for understanding the scattering process. The ocean bottom contains a wide spectrum of roughness, ranging from a few millimeters to several kilometers, where small features are superimposed on much larger topographic features. This complex structure, formed by different physical, chemical, and biological forces can be quantitatively described in terms of their statistical properties, i.e., power spectral density and autocorrelation functions. The gross-scale roughness of the sea floor is reasonably well known due to well-developed echo-sounding techniques. However, little is known about small-scale roughness (amplitudes and wavelengths ranging from centimeters to meters) due to the difficulties of measuring them. The major technique for studying this small-scale roughness is bottom photography. By using photogrammetric techniques, a single pair of overlapping photographs taken with underwater stereo cameras can subsequently be used to provide fine-scale contour charts of the sea floor. To analyze these contoured charts quantitatively, a numerical method had been developed to calculate the two-dimensional bottom-roughness power spectral density and autocorrelation functions. GRA

N86-12944# Helsinki Univ. Technology, Otaniemi (Finland).
INVESTIGATION OF ICE DYNAMICS IN THE MARGINAL ICE ZONE Interim Technical Report, 1 Sep. 1984 - 15 May 1985
M. Leppaeranta 15 May 1985 10 p
(Contract DAJA45-83-C-0034)
(AD-A157557) Avail: NTIS HC A02/MF A01 CSCL 08/12

Most of the work this year was involved with processing the data of MIZEX-83 and MIZEX-84 experiments in the Greenland Sea. MIZEX-83 was a pilot study program where ice kinematics data could be collected for about ten days. (see Fourth Interim Report). Ocean current measurements were made simultaneously by the Univ. of Bergen, and they had three stations in the same ice floes as we had transponders for the ice kinematics study. MIZEX-84 was the main summer experiment of the MIZEX program. Iced kinematics data was collected for forty days from R/V Polarqueen, which was the main drifting station. A manuscript was prepared on one-dimensional modeling studies of ice drift in the marginal ice drift in the marginal ice zone. GRA

N86-12945# Massachusetts Univ., Amherst.
AUTOMATIC DETECTION OF GULF STREAM RINGS Technical Report, Mar. 1984 - Jun. 1985
M. F. Janowitz Jun. 1985 20 p
(Contract N00014-79-C-0629)
(AD-A157934; TR-J8501) Avail: NTIS HC A02/MF A01 CSCL 17/5

A prototype for a program for the automatic detection of Gulf Stream rings from satellite IR images is described and illustrated. It includes a comparative study of 40 different filters on real data. The program involves a number of components: image smoothing, image simplification, edge detection, removal of small objects, and ellipse detection. Author (GRA)

N86-12946# Coastal Engineering Research Center, Vicksburg, Miss.
A USER'S GUIDE TO THE COASTAL ENGINEERING RESEARCH CENTER'S (CERC'S) FIELD RESEARCH FACILITY Final Report
W. A. Birkemeier, H. C. Miller, S. D. Wilhelm, A. E. DeWall, and C. S. Gorbics May 1985 139 p
(AD-A157966; CERC-IR-85-1) Avail: NTIS HC A07/MF A01 CSCL 13/2

The Coastal Engineering Research Center's (CERC's) Field Research Facility (FRF) at Duck, N.C., is a 561-m-(1,840-ft-) long pier and laboratory dedicated to basic and applied coastal research. This report, which describes the facility, the instrumentation and data being collected, and the local area, is designed to be used as an aid in planning experiments to be conducted at the facility. Use of the FRF by coastal researchers is encouraged. Author (GRA)

N86-12947# Coastal Engineering Research Center, Vicksburg, Miss.
EXTREMAL ANALYSIS OF HINDCAST AND MEASURED WIND AND WAVE DATA AT KODIAK, ALASKA Final Technical Report
M. E. Andrew, O. P. Smith, and J. M. McKee Jun. 1985 78 p
(AD-A158136; CERC-TR-85-4) Avail: NTIS HC A05/MF A01 CSCL 08/3

This study was conducted to provide an analysis of hindcast and measured wave and wind data for Kodiak, Alaska. The purpose of the analysis was to obtain long-term extreme wave conditions for the St. Paul Harbor at Kodiak. This study was accomplished by means of extremal analyses of deepwater hindcast data from the nearest Wave Information Study (WIS) grid point outside Chiniak Bay. Long-term wind measurements were used to validate the results obtained from the analyses of the hindcast data. The local wave climate and attenuation factor for swell crossing the reef into St. Paul Harbor were derived using measured wave data from the area. GRA

N86-12948# National Center for Atmospheric Research, Boulder, Colo.
MARINE BOUNDARY LAYER FROM AIR-SEA INTERFACE TO INVERSION
J. A. Businger Mar. 1985 94 p refs Sponsored in part by NSF
(PB85-188274; NCAR/TN-252/STR) Avail: NTIS HC A05/MF A01 CSCL 08C

An overview is given of the structure of the marine boundary layer including the molecular interaction at the interface, the transfer processes in the surface layer, and the entrainment at the top of the boundary layer both for the clear and cloud topped case. Special emphasis is given on a qualitative physical understanding of the processes in and the structure of the boundary layer. The response of the boundary layer to mesoscale variations in sea surface temperature is discussed. Some evidence is given that the effect on the fluxes is larger than what is calculated for the boundary layer assuming a quasisteady state. GRA

N86-12642# Joint Publications Research Service, Arlington, Va.
STUDY OF SIGNIFICANCE OF BOTTOM RELIEF IN BAROCLINIC MODEL OF EQUATORIAL COUNTERCURRENT Abstract Only
T. F. Kuzmicheva, E. N. Mikhaylova, and N. B. Shapiro *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 14 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atm. i Okeana (Moscow), v. 21, no. 1, Jan. 1985 p 58-65 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

N86-12646# Joint Publications Research Service, Arlington, Va.
SPECTRUM OF TURBULENT FLUCTUATIONS IN SEA WATER DENSITY IN REGION OF LARGE WAVE NUMBERS Abstract Only
M. A. Bramson, A. D. Fedorovskiy, V. I. Nikishov, and G. L. Luchnik *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 16 Transl. into ENGLISH from Dokl. Akad. Ukr. SSR, Ser. A: Fiz-Mat. i Tekhn. Nauki (Kiev), no. 12, Dec. 1984 p 35-38 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

N86-12647# Joint Publications Research Service, Arlington, Va.
INTERACTION OF SOUND WAVES WITH FINE THERMOHALINE STRUCTURES OF OCEAN Abstract Only
V. V. Artelnyy and M. A. Rayevskiy *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 17 Transl. into ENGLISH from Akust. Zh. (Moscow), v. 30, no. 6, Nov. - Dec. 1984 p 728-734 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

N86-12653# Joint Publications Research Service, Arlington, Va.
GEOCHEMISTRY AND ENERGETICS OF CYCLING OF MATTER IN FORMATION OF CRUST IN ACTIVE STRUCTURES OF OCEAN Abstract Only

V. A. Ilin and A. V. Shcherbakov *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 22 Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 279, no. 5, Dec. 1984 p 1184-1189 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

N86-12654# Joint Publications Research Service, Arlington, Va.
CONTRIBUTION OF DIFFUSION PROCESSES TO THE ELECTRIC FIELD OF THE OCEAN Abstract Only
P. Ya. Tishchenko *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 24 Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 279, no. 5, Dec. 1984 p 1234-1238 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

N86-12662# Joint Publications Research Service, Arlington, Va.
ELECTROMAGNETIC FIELD OF THREE-DIMENSIONAL SURFACE SEA WAVES Abstract Only
V. V. Sochelnikov *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 29-30 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Zemli (Moscow), no. 2, Feb. 1985 p 65-69 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

N86-12667# Joint Publications Research Service, Arlington, Va.
INFLUENCE OF SESTON PHOSPHATASE ACTIVITY ON RATE OF PHOSPHORUS MINERALIZATION AND ITS RECYCLING IN PRODUCTION-DESTRUCTION CYCLE Abstract Only
A. I. Agatova, V. V. Sapozhnikov, and V. R. Vintovkin *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 36-37 Transl. into ENGLISH from Okeanol. (Moscow), v. 25, no. 1, Jan. - Feb. 1985 p 66-73 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

N86-12668# Joint Publications Research Service, Arlington, Va.
ORIGIN OF ELEMENT COMPOSITION OF OCEAN WATER Abstract Only
Yu. T. Chuburkov and I. A. Zotov *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 37 Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 280, no. 5, Feb. 1985 p 1234-1238 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

N86-12670# Joint Publications Research Service, Arlington, Va.
NONLINEAR MODEL OF ADAPTATION OF FIELDS OF DENSITY AND CURRENTS IN SEA Abstract Only
Yu. L. Demin and D. I. Trukhchev *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 39 Transl. into ENGLISH from Izv Akad. Nauk SSSR: Fiz. Atm. i Okeana (Moscow), v. 20, no. 12, Dec. 1984 p 1171-1182 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

N86-12672# Joint Publications Research Service, Arlington, Va.
EDDY FLUXES OF HEAT, VORTICITY AND MOMENTUM IN OCEAN AND ATMOSPHERE AND THEIR PARAMETERIZATION (REVIEW) Abstract Only
V. O. Ivchenko and A. V. Klepikov *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 40 Transl. into ENGLISH from Okeanol. (Moscow), v. 25, no. 1, Jan. - Feb. 1985 p 5-18 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

N86-12674# Joint Publications Research Service, Arlington, Va.
FEATURES OF GEOSTROPHIC CIRCULATION RELATED TO NATURE OF BOTTOM RELIEF IN NORTHWESTERN ATLANTIC Abstract Only
Z. I. Kizner *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 4142 Transl. into ENGLISH from Okeanol. (Moscow), v. 25, no. 1, Jan. - Feb. 1985 p 26-31 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

N86-12675# Joint Publications Research Service, Arlington, Va.
CYCLONIC FRONTAL EDDY IN ANTARCTIC CIRCUMPOLAR CURRENT Abstract Only
Yu. A. Ivanov, A. Yu. Krasnopevtsev, Ye. G. Morozov, I. F. Shadrin, and A. D. Shcherbinin *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 42 Transl. into ENGLISH from Okeanol. (Moscow), v. 25, no. 1, Jan. - Feb. 1985 p 32-36 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

N86-12678# Joint Publications Research Service, Arlington, Va.
ROLE OF AHERMATYPIC CORALS IN SEDIMENTATION AND ECOLOGY OF CORAL BANKS Abstract Only
N. B. Keller *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 47-48 Transl. into ENGLISH from Okeanol. (Moscow), v. 25, no. 1, Jan. - Feb. 1985 p 113-116 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

N86-12679# Joint Publications Research Service, Arlington, Va.
NEW DATA OF RELIEF OF MAZCA RIDGE Abstract Only
L. A. Zakharov *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 48-49 Transl. into ENGLISH from Okeanol. (Moscow), v. 25, no. 1, Jan. - Feb. 1985 p 124-129 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

N86-12699# Joint Publications Research Service, Arlington, Va.
EXPERIMENTAL STUDY OF EQUILIBRIUM INTERVAL IN FREQUENCY SPECTRA OF WIND WAVES IN SEA OF FINITE DEPTH Abstract Only
I. A. Alekperov, N. I. Akhmedov, A. I. Gumbatov, A. S. Ismaylov, S. G. Magerramova, and T. M. Tatrayev *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-008) 16 Aug. 1985 p 6 Transl. into ENGLISH from Izv. Akad. Nauk Azerbaydzhanskoy SSR, Ser. Nauki o Zemle (USSR), no. 6, 1984 p 119-123 (For primary document see N86-12697 03-42)
Avail: NTIS HC A04/MF A01

N86-12700# Joint Publications Research Service, Arlington, Va.
FEATURES OF ELECTRICAL MEASUREMENTS IN SEA AS MEDIUM WITH FIELD OF EXTRANEOUS FORCES Abstract Only
V. I. Loptnikov *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-008) 16 Aug. 1985 p 7 Transl. into ENGLISH from Geofiz. Zh. (Kiev), v. 7, no. 7, Mar. - Apr. 1985 p 59-68 (For primary document see N86-12697 03-42)
Avail: NTIS HC A04/MF A01

N86-12702# Joint Publications Research Service, Arlington, Va.
QUASIGEOSTROPHIC MODEL OF CIRCULATION IN ANTARCTIC OCEAN WITH PARAMETRIZATION OF SYNOPTIC EDDIES Abstract Only
V. O. Ivchenko and A. V. Klepikov *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-008) 16 Aug. 1985 p 8 Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 281, no. 4, Apr. 1985 p 944-948 (For primary document see N86-12697 03-42)
Avail: NTIS HC A04/MF A01

N86-12707# Joint Publications Research Service, Arlington, Va.
OCEAN ALBEDO FOR ATMOSPHERIC THERMAL EMISSION Abstract Only
R. G. Gardashov, Zh. K. Zolotova, and K. S. Shifrin *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-008) 16 Aug. 1985 p 12 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atm. i Okeana (Moscow), v. 21, no. 4, Apr. 1985 p 438-440 (For primary document see N86-12697 03-42)
Avail: NTIS HC A04/MF A01

N86-12708# Joint Publications Research Service, Arlington, Va.
INVESTIGATION OF ELASTIC PROPERTIES OF MARINE SURFACE-ACTIVE FILMS Abstract Only

B. T. Demin, S. A. Yermakov, Ye. N. Pelinovskiy, T. G. Talipova, and A. I. Sheremetyeva *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-008) 16 Aug. 1985 p 12-13 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atm. i Okeana (Moscow), v. 21, no. 4, Apr. 1985 p 410-416 (For primary document see N86-12697 03-42)
Avail: NTIS HC A04/MF A01

N86-12711# Joint Publications Research Service, Arlington, Va.
FINE STRUCTURE OF DENSITY RELATION IN MAIN OCEANIC THERMOCLINE Abstract Only
V. M. Zhurbas *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-008) 16 Aug. 1985 p 17 Transl. into ENGLISH from Okeanol. (Moscow), v. 25, no. 2, Mar. - Apr. 1985 p 215-218 (For primary document see N86-12697 03-42)
Avail: NTIS HC A04/MF A01

N86-12712# Joint Publications Research Service, Arlington, Va.
VISCOUS NONLINEAR CIRCULATION IN AXISYMMETRIC BAROCLINIC EDDY Abstract Only
D. O. Gordeyvhev and G. G. Sutyrin *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-008) 16 Aug. 1985 p 18 Transl. into ENGLISH from Okeanol. (Moscow), v. 25, no. 2, Mar. - Apr. 1985 p 186-192 (For primary document see N86-12697 03-42)
Avail: NTIS HC A04/MF A01

N86-12713# Joint Publications Research Service, Arlington, Va.
FACIES-GENETIC GROUPS OF COARSE CLASTIC MATERIAL ON WORLD OCEAN FLOOR Abstract Only
N. N. Kachanov *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-008) 16 Aug. 1985 p 18-19 Transl. into ENGLISH from Dokl. Akad. Nauk Ukr. SSR, Ser. B: Geol. Khim i Biol. Nauki (Kiev), no. 4, Apr. 1985 p 27-31 (For primary document see N86-12697 03-42)
Avail: NTIS HC A04/MF A01

N86-12714# Joint Publications Research Service, Arlington, Va.
SPATIAL STRUCTURE OF HIGH-FREQUENCY SEA WIND WAVES UNDER DIFFERENT METEOROLOGICAL CONDITIONS Abstract Only
I. I. Strizhkin, M. P. Lapchinskaya, Yu. A. Ilin, and V. A. Malinnikov *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-008) 16 Aug. 1985 p 19-20 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atm. i Okeana (Moscow), v. 21, no. 4, Apr. 1985 p 440-442 (For primary document see N86-12697 03-42)
Avail: NTIS HC A04/MF A01

N86-12724# Joint Publications Research Service, Arlington, Va.
DETERMINATION OF DYNAMIC PARAMETERS OF REFLECTED WAVES ON SLOPES OF DEEP WATER TRENCH Abstract Only
V. G. Bykov, F. A. Vorobyev, V. V. Zhigulev, and S. S. Snegovskoy *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-008) 16 Aug. 1985 p 32 Transl. into ENGLISH from Tikhookeanskaya Geol. (Novosibirsk), no. 1, Jan. - Feb. 1985 p 99-103 (For primary document

N86-12882*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
GLOBAL MEAN SEA SURFACE COMPUTATION BASED UPON A COMBINATION OF SEASAT AND GEOS-3 SATELLITE ALTIMETER DATA Abstract Only
J. G. Marsh, C. J. Koblinsky, A. Brenner (Edgerton, Germeshausen and Grier, Inc., Riverdale, Md.), B. Beckley (Edgerton, Germeshausen and Grier, Inc., Riverdale, Md.), and T. Martin (Edgerton, Germeshausen and Grier, Inc., Riverdale, Md.) *In* NASA, Washington Geopotential Res. Mission (GRM) Oct. 1985 p 77 (For primary document see N86-12852 03-46)
Avail: NTIS HC A07/MF A01 CSCL 08J

N86-12883*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
CONTRIBUTIONS OF GRM TO THE OCEAN TOPOGRAPHY EXPERIMENT (TOPEX) Abstract Only
Robert Stewart *In* NASA, Washington Geopotential Res. Mission (GRM) Oct. 1985 p 78 (For primary document see N86-12852 see N86-12697 03-42)
Avail: NTIS HC A04/MF A01

03-46)
Avail: NTIS HC A07/MF A01 CSCL 08J

51 LIFE SCIENCES (GENERAL)

Includes genetics.

N86-12949*# Management and Technical Services Co., Washington, D.C.
USSR SPACE LIFE SCIENCES DIGEST, ISSUE 2
Lydia Razran Hooke, ed., Mike Radtke, ed., Victoria Garshnek, ed., Joseph E. Rowe, ed., and Ronald Teeter, ed. Washington NASA Oct. 1985 96 p
(Contract NASw-3676)
(NASA-CR-3922(02); NAS 1.26:3922(02)) Avail: NTIS HC A05/MF A01 CSCL 06C

The second issue of the bimonthly digest of USSR Space Life Sciences is presented. Abstracts are included for 39 Soviet periodical articles in 16 areas of aerospace medicine and space biology and published in Russian during the first half of 1985. Selected articles are illustrated with figures from the original. Translated introductions and tables of contents for 14 Russian books on 11 topics related to NASA's life science concerns are presented. Areas covered are: adaptation, biospheric, body fluids, botany, cardiovascular and respiratory systems, cybernetics and biomedical data processing, gastrointestinal system, group dynamics, habitability and environmental effects, health and medical treatment, hematology, immunology, life support systems, metabolism, musculoskeletal system, neurophysiology, psychology, radiobiology, and space biology. Two book reviews translated from Russian are included and lists of additional relevant titles available either in English or in Russian only are appended. E.A.K.

N86-12950# Army Engineer Waterways Experiment Station, Vicksburg, Miss. Environmental Lab.
ENVIRONMENTAL IMPACT RESEARCH PROGRAM. STATUS AND SOURCE OF HABITAT MODELS AND LITERATURE REVIEWS, DECEMBER 1984 Final Report
T. H. Roberts, L. J. ONeil, and W. E. Jabour Apr. 1985 18 p Revised
(AD-A156899; WES/MP/EL-85-1-Rev) Avail: NTIS HC A02/MF A01 CSCL 06/6

This report summarizes the status and availability of selected species habitat models and other habitat-related documents developed by the US Fish and Wildlife Service and other agencies. This listing is not comprehensive since many universities and other organizations are now involved with model development and testing. Animal groups included are birds, mammals, amphibians, reptiles, fish, molluscs, and other crustaceans. Information listed includes scientific name, special status of the species (if any), the organization responsible for the development of the model or the literature review, the stage of development of the document, and whether the document has received outside review or testing.
GRA

N86-12951# Los Alamos National Lab., N. Mex.
RAMAN ACTIVITY IN SYNCHRONOUSLY DIVIDING BACTERIA
S. P. Layne 1985 12 p refs Presented at the Computer Anal. for Life Sci., Okayama, Japan, 9 Jul. 1985
(Contract W-7405-eng-36)
(DE85-015672; LA-UR-85-2368; CONF-850784-1) Avail: NTIS HC A02/MF A01

Using a spectrometer equipped with an optical-multichannel analyzer as the detector (OMA), we have observed the Stokes laser-Raman spectra of metabolically active Escherichia coli and Bacillus magaterium from 100 to 2100 cm(-1). After lengthy investigation, no Raman lines attributable to the metabolic process nor the cells themselves were found. Previous Raman spectra of active bacteria cannot be used to support nonlinear theories in biology. DOE

N86-12952# California Univ., Berkeley. Lawrence Berkeley Lab.
MONITORING OF CIRCADIAN WAVEFORMS IN RODENTS EXPOSED TO HIGH-INTENSITY STATIC MAGNETIC FIELDS
T. S. Tenforde, L. Levy, and E. Veklerov Oct. 1984 38 p refs Presented at the 23rd Hanford Life Sci. Symp., Interaction of Biol. Systems with Static and ELF Elec. and Magnetic Fields, Richland, Wash., 2 Oct. 1984
(Contract DE-AC03-76SF-00098)
(DE85-015225; LBL-18384; CONF-841041-2) Avail: NTIS HC A03/MF A01

A system was developed for the noninvasive monitoring of circadian variables in mice exposed to a 1.50 T static magnetic field. The ambient light level, temperature and relative humidity within the exposure chamber are closely regulated, and physiological monitoring systems provide simultaneous measurements of seven circadian variables: (1) climbing activity on a triangular bar; (2) migratory activity; (3) body mass; (4) respired carbon dioxide; (5) nutrient consumption; (6) urine excretion; and (7) fecal excretion. Data from the various transducers and environmental monitoring devices within the exposure system are recorded on magnetic tape at 5-min intervals throughout experiments of 50 to 60 days duration, and the circadian waveforms of behavior and physiological parameters are analyzed by a modification of the cosiner method using a high-speed computer. Exposure of adult female LAF-1 mice to a 1.50-T homogeneous field for 5 continuous days, or for 10 consecutive days with intermittent daily exposures on an 8-hr-on/16-hr-off cycle, is found to produce no significant alterations in the circadian waveforms of behavioral or physiological parameters. DOE

N86-12953# Oak Ridge National Lab., Tenn.
BIOMEDICAL AND ENVIRONMENTAL SCIENCES PROGRAM PUBLICATIONS 1984
H. E. Gerstner, K. M. Branam, L. W. Littleton, V. S. Norman, and E. H. Thompson Jul. 1985 86 p
(Contract DE-AC05-84OR-21400)
(DE85-015070; ORNL-6201) Avail: NTIS HC A05/MF A01

A bibliography is given containing 665 references to journal articles, books, book chapters, proceedings, reports, and abstracts. Certain types of publications are not included: theses, book reviews, internal documents, and periodic progress reports (with the exception of annual reports). Publications from divisions that report to the Associate Laboratory Director for Biomedical and Environmental Sciences (ADBES) are listed here, as well as publications from divisions that receive funding through the ADBES office. The references are sorted by type (journal articles, etc.), then by division, and, within each division, alphabetically by first author. Author and journal indexes are included in the back. DOE

52 AEROSPACE MEDICINE

Includes physiological factors; biological effects of radiation; and weightlessness.

N86-12954* National Aeronautics and Space Administration, Washington, D. C.
AEROSPACE MEDICINE AND BIOLOGY CONTINUING BIBLIOGRAPH: A CONTINUING BIBLIOGRAPHY WITH INDEXES
Oct. 1985 64 p
(NASA-SP-7011(276); NAS 1.21:7011(276)) Avail: NTIS HC A04 CSCL 06E

This bibliography lists 184 reports, articles, and other documents introduced into the NASA scientific and technical information system in September 1985. F.M.R.

N86-12955 Department of the Navy, Washington, D. C.
INFRARED OPTICAL MEASUREMENT OF BLOOD GAS CONCENTRATIONS AND FIBER OPTIC CATHETER Patent
T. J. Manuccia and J. G. Eden, inventors (to Navy) Issued 9 Apr. 1985 7 p
(AD-D011836; US-Patent-4,509,522; US-Patent-Appl-SN-331091; US-Patent-Class-128-634) Avail: US Patent and Trademark Office CSCL 06/12

This patent pertains to a simple compact optical device and method for quickly measuring the concentration of CO and CO2, bound to hemoglobin or dissolved in a person's blood using optical techniques which do not require removing a blood sample from the body. It also provides a simple fiber optic device for measuring blood-gas concentrations of critical internal points of the circulatory system such as the aorta. GRA

N86-12956*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
PLASMA VOLUME METHODOLOGY: EVANS BLUE, HEMOGLOBIN-HEMATOCRIT, AND MASS DENSITY TRANSFORMATIONS
J. E. Greenleaf and H. Hinghofer-Szalkay Nov. 1985 25 p refs
(NASA-TM-86834; Rept-85406; NAS 1.15:86834) Avail: NTIS HC A02/MF A01 CSCL 06P

Methods for measuring absolute levels and changes in plasma volume are presented along with derivations of pertinent equations. Reduction in variability of the Evans blue dye dilution technique using chromatographic column purification suggests that the day-to-day variability in the plasma volume in humans is less than + or - 20 m1. Mass density determination using the mechanical-oscillator technique provides a method for measuring vascular fluid shifts continuously for assessing the density of the filtrate, and for quantifying movements of protein across microvascular walls. Equations for the calculation of volume and density of shifted fluid are presented. E.A.K.

N86-12957# Department of the Army, Washington, D. C.
FORWARD FIELD AUTOTRANSFUSION DEVICE Patent Application
E. I. Schweitzer and K. G. Swan, inventors (to Army) Filed 10 May 1985 12 p
(AD-D011763; US-Patent-Appl-SN-732335) Avail: NTIS HC A02/MF A01 CSCL 06/12

A typical embodiment of the invention enables blood to be drawn from the pleural cavity of an injured patient for autotransfusion purposes. A chest tube is connected to an inlet check valve within a resilient bulb suction pump. Blood, drawn into the bulb, is expelled therefrom by manipulating the bulb to cause the blood to flow out of the bulb through a filter and a discharge check valve to a blood collection bag. GRA

N86-12958# Department of the Army, Washington, D. C.
SUTURE NEEDLE HOLDER Patent Application
E. J. Schweitzer and J. R. Bresch, inventors (to Army) Filed 3 Jun. 1985 15 p
(AD-D011764; US-Patent-Appl-SN-740610) Avail: NTIS HC A02/MF A01 CSCL 06/12

A typical embodiment on the invention enables a surgeon to occupy only one hand in manipulating a suture needle. The instrument thumb handle has, on one end, a freely rotatable short roller. The ring finger handle, moveover, has a long roller that is journalled within that handle. One end of the long roller bears against the short roller to form a nip that engages the suture needle. The other end of the long roller terminates near the ring finger handle grip to enable the surgeon to rotate the long roller with another finger of the same hand and thereby draw the needle through the nip, repositioning the needle for another stitch. GRA

N86-12959# School of Aerospace Medicine, Brooks AFB, Tex.
PROCEEDINGS OF A WORKSHOP ON RADIOFREQUENCY RADIATION BIOEFFECTS HELD AT WACHTBERG-WERTHHOVEN, WEST GERMANY ON 11-13 SEPTEMBER 1984 Final Report
J. C. Mitchell Apr. 1985 241 p Presented at Workshop held at Wachtberg-Werthhoven, West Germany, 11-13 Sep. 1984
(AF Proj. 7757)
(AD-A157090; USAFSAM-TP-85-14) Avail: NTIS HC A11/MF A01 CSCL 06/18

The workshop was convened to address new developments

in the setting and application of RFR (Radiofrequency Radiation) safety standards, assessment of RFR levels in the military environment, RFR instrumentation and dosimetry, the medical approach to specific problems, and important state-of-the-art research regarding the biological effects of long-term low-level RFR exposures, pulsed versus continuous wave effects, and the effects of unique pulse modulation. The collected papers represent the contributions of various experts in the field from the NATO countries, brought together under the the sponsorship of Defense Research Group, Panel 8, NATO AS/243, at the Research Establishment for Applied Science, D-5307 Wachtberg-Werthhoven, Federal Republic of Germany. GRA

N86-12960# Letterman Army Inst. of Research, San Francisco, Calif.
ENERGY EXPENDITURE AND ACTIVITY PATTERNS OF CADETS AT THE UNITED STATES MILITARY ACADEMY, WEST POINT, NEW YORK Final Report, for Period Ending Oct. 1979
M. J. Kretsch, M. O. OConnor, and H. E. Sauberlich Jun. 1985 42 p
(AD-A157857; LAIR-IR-200) Avail: NTIS HC A03/MF A01 CSCL 06/16

A study was conducted in October, 1979, at the United States Military Academy, West Point, New York, to evaluate factors contributing to weight gain in cadets over the course of their academic career. This report presents the average daily energy expenditure (EE) and activity patterns of male and female cadets. A total of 136 male and 54 female cadets from the classes of 1980, 1981, 1982, and 1983 were studied. Five consecutive days (Wednesday through Sunday) of activity data were collected from each study participant by the factorial method. The average pattern of EE usage was similar between male and female cadets: about 20% at rest; 35 to 40% in very light activities; 5 to 10% in light activities; about 25% in moderate activities; and the remaining 5 to 15% in heavy or very heavy activities. Average energy expenditure when expressed as kcal/kg body weight was not significantly different between male and female cadets of the same class for weekdays or weekend days. There was a tendency for the cadets to become more sedentary with advance in class. This was more noticeable for the females than for the males. There was a significant decrease in weekday, but not weekend day, EE for the females with advance in class. This same decrease was not significant for the male cadets, but there was a weekday trend in that direction. For the females, the lower weekday EE for the 1980 and 1981 classes may be explained by the lower amount of energy and time spent in running and sports activities. Whether the decrease in weekday EE with advance in class is due to differences in program requirements should be examined. GRA

N86-12961# Brown Univ., Providence, R. I. Center for Neural Science.
CORTICAL PLASTICITY: THEORETICAL ANALYSIS, EXPERIMENTAL RESULTS
L. N. Cooper 31 Jul. 1985 34 p
(Contract N00014-81-K-0136)
(AD-A157965; TR-27) Avail: NTIS HC A03/MF A01 CSCL 06/15

An account is given of a theory of and experimental results on development and modification of selectivity and ocular dominance in visual cortex. The single cell theory is generalized to be applicable to a neural network. Also discussed, in the context of the theoretical ideas, are experiments on the modifiability of inhibitory cells and on possible candidates for global controllers of learning. GRA

N86-12962# Department of the Army, Washington, D. C.
DERMAL SUBSTANCE COLLECTION DEVICE Patent Application
C. C. Peck, inventor (to Army) Filed 11 Feb. 1985 29 p
(AD-D011848; US-Patent-Appl-SN-660778) Avail: NTIS HC A03/MF A01 CSCL 14/2

This patent application describes a dermal substance collection device (DSCD) which provides means for the non-invasive, instantaneous and continuous monitoring of chemical substances which are present in a detectable amount in either or both interstitial fluid or sweat or which are on or in the skin. The transdermal substance collection device of this invention is comprised of three essential components: (1) a substance binding reservoir, wettable by, (2) a liquid transfer medium which allows for liquid bridge transfer of a soluble substance from the skin surface to the binding reservoir by virtue of its wettability by the liquid, and (3) an occlusive cover. GRA

N86-12963# School of Aerospace Medicine, Brooks AFB, Tex.
THE EFFECTS OF HYPOXIA INDUCED BY LOW ATMOSPHERIC PRESSURE ON SOFT CONTACT LENS WEAR Final Report, 1 Jun. 1983 - 1 Jan. 1985
W. J. Flynn, R. E. Miller, II, M. G. Block, and T. J. Tredici Jun. 1985 16 p
(AF Proj. 2729)
(AD-A158556; USAFSAM-TR-85-30) Avail: NTIS HC A02/MF A01 CSCL 06/12

Contact lens use in aviation has long been a subject of debate and controversy. One of the major concerns for contact lens wear at altitude is the potential for corneal edema and subsequent visual degradation, due to the reduced levels of oxygen available for normal corneal metabolism. Four subjects were tested, wearing both high-and low-water content soft contact lenses, for visual changes and adverse corneal physiological responses due to hypoxia induced by an atmospheric pressure level equivalent to 10,000 ft. Results of this study indicate that, although the cornea is placed under higher levels of physiological stress at an altitude of 10,000 ft, the absence of visual degradation or significant symptoms suggests that lenses can be safely worn under the conditions of this study. Author (GRA)

N86-12964# National Academy of Sciences - National Research Council, Washington, D. C.
STUDIES OF PARTICIPANTS IN NUCLEAR TESTS Final Report, 1 Sep. 1978 - 31 Oct. 1984
C. D. Robinette, S. Jablon, and T. L. Preston May 1985 102 p refs
(Contract DE85-AI08-78EV-01577)
Avail: NTIS HC A06/MF A01

Mortality, by cause of death, was studied on a cohort of 46,186 participants in one or more of five test series. The series studied were UPSHOT-KNOTHOLE (1953) and PLUMBBOB (1957) at the Nevada Test Site, and GREENHOUSE (1951), CASTLE (1954), and REDWING (1956) which were conducted at the Pacific Proving Ground at Enewetak and Bikini. The number of deaths attributed to particular causes was compared with the number expected to occur at US cause and age-specific mortality rates. A total of 5113 deaths from all causes was ascertained; this was 11.1% of the number of participants. The number was, however, only 83.5% of the number expected at US mortality rates. Mortality from leukemia among the 3554 participants at SMOKY - 10 deaths below age 85 - were 2.5 times the expected number. When the leukemia deaths are compared to other deaths in all six data sets, the differences among the series are not significant. No cancer other than leukemia was ascertained to have occurred in significant excess among SMOKY participants and the number of deaths from other cancers (67) was less than the number expected at population rates (83.8). The total body of evidence cannot convincingly affirm or deny that the higher than statistically expected incidence of leukemia among SMOKY participants (or of prostate cancer among REDWING participants) is the result of radiation exposure incident to the tests. DOE

N86-12965# Pacific Northwest Lab., Richland, Wash.
ACCIDENTAL EXPOSURE TO AMERICIUM
K. R. Heid Apr. 1985 13 p refs Presented at the Health Phys. Summer School Conf., Evanston, Ill., 3 Jun. 1985
(Contract DE-AC06-76RL-01830)
(DE85-012794; PNL-SA-13155; CONF-8506136-1) Avail: NTIS HC A02/MF A01

An accident in which a 64 year old Hanford nuclear worker was exposed to high levels of americium while working in an americium recovery facility in 1976 is described. As a result of the accident, he was heavily externally contaminated with americium, sustained with a substantial internal deposition of this isotope, and was burned with concentrated nitric acid and injured by flying debris about the face and neck. The immediate and longer term treatment given the patient, including the decontamination efforts and clinical laboratory studies, are discussed. Special in vivo equipment and techniques were used to measure the americium deposited in the patient. These and subsequent in vivo measurements were used to estimate the dose rates and the accumulated doses to body organs. Urinary and fecal excreta were collected and analyzed for americium content. The interpretation of these data was complicated by the fact that the intake resulted both from inhalation and from solubilization of the americium embedded in facial tissues as a result of the accident. A total of 1100 (MU)Ci was excreted in urine and feces during the first 2 years following the accident. The long term use of diethylenetriaminepentaacetic acid (DTPA), used principally as the zinc salt, is discussed including the method, route of administration, and effectiveness. To date, the patient has apparently experienced no complications attributable to this extensive course of therapy, even though he was given approximately 560 g of DTPA. DOE

N86-12966# Joint Publications Research Service, Arlington, Va.
CHINA REPORT: SCIENCE AND TECHNOLOGY
18 Jun. 1985 117 p refs Transl. into ENGLISH from various Chinese articles
(JPRS-CST-85-019) Avail: NTIS HC A06/MF A01

Progress in science and technology in the People's Republic of China is reported. Topics discussed include: national developments, life sciences, biochemistry, biology, cement industry, chemistry, computers, engineering, industrial hygiene, medical science, microbiology, pharmacology, radiology, semiconductor materials, and telecommunications. For individual titles, see N86-12967 through N86-12967.

N86-12967# Joint Publications Research Service, Arlington, Va.
PROTECTION OF EYES AGAINST LASER DAMAGE STUDIED
Guan Chongwen, Wang Rongzhen, and Jin Humei *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-019) 18 Jun. 1985 p 41-48 refs Transl. into ENGLISH from Zhongguo Jiguang (Shanghai), no. 2, 20 Feb. 1985 p 113-117 (For primary document see N86-12966 03-52)
Avail: NTIS HC A06/MF A01

The potential hazards of lasers were analyzed in eye injuries caused by lasers. Hygienic physical experiments were performed on reflected laser light from hitting spots which caused most eye injuries. Measures for the protection of eyes against laser damage are discussed. E.A.K.

N86-12377# Tokyo Denki Univ. (Japan). Faculty of Engineering.
EFFECTS OF CATION IONS IN NERVE EXCITATION
Kazuyuki Aihara, Makoto Kotani, and Toshio Utsunomiya *In its* Res. Rept. of the Faculty of Eng., Tokyo Denki Univ., No. 32 Dec. 1984 p 67-78 refs In JAPANESE; ENGLISH summary (For primary document see N86-12372 03-31)
Avail: NTIS HC A09/MF A01

N86-12458# Joint Publications Research Service, Arlington, Va.
HUMAN HEMODYNAMIC CHANGE UNDER HIGH ATMOSPHERIC PRESSURE
Zhang Hengdu and Dai Duanyang *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-030) 4 Sep. 1985 p 55-56 Transl. into ENGLISH from Jiefangjun Yixue Zazhi (Beijing), no. 1, 20 Feb. 1985 p 63 (For primary document see N86-12451 03-31)
Avail: NTIS HC A08/MF A01

53 BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

N86-12968# Air Command and Staff Coll., Maxwell AFB, Ala.
THE HELICOPTER TO FIXED WING CONVERSION PROGRAM: A CRITICAL REVIEW
L. T. Massey Apr. 1985 39 p
(AD-A156820; ACSC-85-1750) Avail: NTIS HC A03/MF A01 CSCL 05/9

USAF helicopter pilots are initially trained by the U.S. Army through their undergraduate helicopter pilot training program. Four to seven years later, some of these pilots have the opportunity to convert to fixed wing aircraft via the fixed wing conversion program currently conducted by sending selected helicopter pilots through Air Force undergraduate pilot training. This study reviews these programs and assesses the impact this training philosophy has on career opportunities for helicopter pilots, both for those who convert to fixed wing systems, as well as for those who remain in helicopters. Two alternatives are presented which would resolve the problems identified. The study concludes that the USAF could provide better career opportunities for helicopter pilots, as well as improve experience levels in the helicopter force, by enacting changes to current training programs. Author (GRA)

N86-12969# Chicago Univ., Ill. Graduate School of Business.
STIMULUS STRUCTURES AND MENTAL REPRESENTATIONS IN EXPERT COMPREHENSION OF COMPUTER PROGRAMS Technical Report, Sep. 1982 - Jan. 1985
N. Pennington Jan. 1985 110 p
(Contract N00014-82-K-0759)
(AD-A157520; TR-2-ONR) Avail: NTIS HC A06/MF A01 CSCL 05/10

The difficulty of computer programming and other design tasks is a function of the multiple abstractions that combine to form a program's meaning. Thus, comprehension of the final form of a program design, the program text, involves retrieving multiple sets of relationships between parts. The research presented here addresses which, if any, abstraction is dominant psychologically in programmers' mental representation of programs, specifically whether procedural (control flow) or functional (goal hierarchy) abstractions dominate, and the relative ease or difficulty of inferring different kinds of information from the text. Eighty professional programmers were tested on comprehension and recognition of short program texts. The results, which suggest that procedural rather than functional units form the basis of expert programmers' mental representations, support work in other areas of test comprehension showing the importance of test structure knowledge in understanding. The results also raise questions concerning claims that chunking found in comprehension and memory tasks in skilled problem solving domains is due to pattern matching to schematic content knowledge rather than to knowledge of more abstract text or design structure units. GRA

N86-12970# California Univ., San Diego, La Jolla. Inst. for Cognitive Science.
HUMAN COGNITION AND PERFORMANCE Final Report, Apr. 1979 - Mar. 1985
D. A. Norman, D. E. Rumelhart, and D. R. Gentner 1 May 1985 101 p
(Contract N00014-79-C-0323)
(AD-A157665) Avail: NTIS HC A06/MF A01 CSCL 05/10

The Cognitive Science Laboratory is a part of both the Institute for Cognitive Science and the Center for Human Information Processing at their University of California, San Diego. Work in the laboratory is aimed at developing a deeper understanding of the theory and applications of human information processing. The research aims of the laboratory are broad, but all the work follows a common theoretical view of cognition, providing a cohesion that binds the separate studies together, despite the apparent wide differences in content. All of the work can be characterized as

being Studies of Human Cognition. This is the main focus of the laboratory's efforts, and over the years the work has covered in-depth problems within the areas of preception, attention, learning, memory, language, thought, and action. Special emphasis has been placed on knowledge representation, and one major contribution of the laboratory has been within the area: The representational structure known as Active Structural Networks. Work in this general area is always in process elaborated and modulated by the results and progress of work in the speciality areas. Three specialty areas can be talked about separately. GRA

N86-12971# Navy Personnel Research and Development Center, San Diego, Calif.
A NEW HAZARD FUNCTION ESTIMATOR OF PERFORMANCE TIME Technical Report, Oct. 1983 - Jul. 1984
B. Bloxom Nov. 1984 35 p
(AD-A157843; NPRDC-TR-85-10) Avail: NTIS HC A03/MF A01 CSCL 05/10

The analysis of performance time is used to study a wide variety of manpower, training, and human factors problems in the Navy. The cumulative distribution of performance time provides some indication of the rate of performance, but it can lead to false conclusions as well. One method of measuring the rate of performance with a shifting residual basis of analysis, called hazard analysis, consists of estimating a hazard function, which shows the rate of performance as a function of time. Although various procedures have been developed for estimating a hazard function, none of the procedures has been shown to produce plausibly smooth and precise estimates under a variety of conditions. This research proposed a constrained quadratic spline as an estimator or the hazard function of performance time. A maximum penalized likelihood procedure was used to fit the estimator to a sample of psychological response times. The procedure was also used in a simulation study of the precision of the estimator. GRA

N86-12972# Illinois Univ., Urbana. Computer-based Education Research Lab.
DIAGNOSING COGNITIVE ERRORS: STATISTICAL PATTERN CLASSIFICATION AND RECOGNITION APPROACH
K. K. Tatsuoka Jan. 1985 36 p
(Contract N00014-82-K-0604; RR0-4204)
(AD-A158108; IU-CERL-RR-85-1-ONR) Avail: NTIS HC A03/MF A01 CSCL 05/10

This paper introduces a probabilistic model that is capable of diagnosing and classifying cognitive errors in a general problem-solving domain. The model is different from the usual deterministic strategies common in the area of artificial intelligence because the item response theory is utilized for handling the variability of response errors. As for illustrating the model, the dataset obtained form a 38-item fraction addition test is used, and the students' responses are classified into 34 groups of misconceptions. These groups are predetermined by the result of an error analysis previously done, and validated with the error diagnostic program written by a typical formal logic approach. GRA

54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing.

N86-12973# Systems Research Labs., Inc., Dayton, Ohio.
CRITERIA FOR A STATE-OF-THE-ART VISION TEST SYSTEM Final Report
K. Moffitt and L. V. Genco May 1985 109 p
(Contract F33615-82-C-0511)
(AD-A157099; AFAMRL-TR-85-004) Avail: NTIS HC A06/MF A01 CSCL 06/16

Many vision test/screening devices used in the Armed Services have not changed since the 1940's. The reduction in the size of the pool of qualified aircrew candidates has caused operational Commands to question the validity of these tests. Current objectives of vision testing have evolved from a means to eliminate pilot candidates to methods of predicting aircrew performance. The Naval Aerospace Medical Research Laboratory (NAMRL) is attempting to correlate the results of several vision tests with the visual abilities of pilot trainees as demonstrated during monitored training flights. This report describes status that could be considered as useful parameters for testing in the Armed Forces vision test battery of the future. One major conclusion is that the operational visual task(s) must be suitably described in order to select appropriate clinical and laboratory test measures. Correlations and validation studies can then be performed with cooperative efforts such as those between NAMRL and AFAMRL. GRA

N86-12974# Department of the Navy, Washington, D. C.
LOW TEMPERATURE INFLATOR APPARATUS Patent Application
J. J. Esposito, inventor (to Navy) Filed 2 May 1985 9 p
(AD-D011810; US-Patent-Appl-SN-729725) Avail: NTIS HC A02/MF A01 CSCL 06/7

This invention relates to inflator apparatus for inflating emergency flotation gear such as life rafts and life jackets; and more particularly to an inflator for flotation gear which may be stored at, and operated in, extremely low temperatures. Liquid CO2 (carbon dioxide) cartridges have been used for many years as the main source of pressurized gas for inflating various types of inflatable life saving devices such as rafts, vests, and jackets. Emergency use of these devices by downed aircrewman has occurred mostly in temperate zones. However, these situations now occur more frequently in the arctic region where temperatures below -20 F are not uncommon. At these low temperatures, liquid CO2 changes too slowly to the gaseous phase to provide immediate buoyancy. A rapid change is especially needed in a life raft to enable a downed person in frigid water to board as soon as possible. The longer he or she remains exposed to the cold water awaiting the formation of a boardable raft, the more likely hypothermia will set in. Raft inflation time in excess of five minutes has been observed when CO2 cartridges were stored in an aircraft at sub-zero temperatures and then activated in water at 32 F. Consequently, lives have been needlessly lost. In lieu of liquid CO2 cartridges, solid pyrotechnic inflators have been tried which generate gas from a compacted solid material, but the gas of combustion does not attain the pressure level needed for buoyancy of inflatable gear. GRA

N86-12975# Oak Ridge National Lab., Tenn.
POWER AND SIGNAL TRANSMISSION FOR MOBILE TELEOPERATED SYSTEMS
A. C. Morris, Jr. and W. R. Hamel 1985 31 p Presented at the Japan/US Spec. Meeting on Remote Systems Technol., Oak Ridge, Tenn., 26 Apr. 1985
(Contract DE-AC05-84OR-21400)
(DE85-013994; CONF-8504132-1) Avail: NTIS HC A03/MF A01

Appropriate means must be furnished for supplying power and for sending controlling commands to mobile teleoperated systems. Because a sizable number of possibilities are available for such applications, methods used in designing both the power and communications systems built into mobile vehicles that serve in radiological emergencies must be carefully selected. This paper describes a number of umbilical, onboard, and wireless systems used in transmitting power that are available for mobile teleoperator services. The pros and cons of selecting appropriate methods from a list of possible communication systems are also examined. Moreover, hybrid systems combining wireless power transmissions with command-information signals are also possible. DOE

N86-12976# Oak Ridge National Lab., Tenn.
FUTURE DIRECTIONS IN MOBILE TELEOPERATION
W. R. Hamel 1985 22 p Presented at the Workshop on Requirements of Mobile Teleoperators for Radiol. Emergency Response and Recovery, Dallas, 23 Jun. 1985
(Contract DE-AC05-84OR-21400)

(DE85-014308; CONF-8506148-3) Avail: NTIS HC A02/MF A01

Mobile teleoperator systems are the subject of an increasing amount of research and development. This work is motivated by general problems of remote operations in hazardous environments, some of which are very similar to the challenges of radiological emergency response and recovery. Current work appears to fall into two broad economic classes, one in the $100 K range and the other in the $1000 K range. Both are believed to be important for technology development and deployment. Recent developments confirm that we are at the technical doorstep of next-generation mobile systems which integrate dexterous manipulation, high mobility, and telerobotic operation. DOE

55 PLANETARY BIOLOGY

Includes exobiology; and extraterrestrial life.

No abstracts in this category.

59 MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

No abstracts in this category.

60 COMPUTER OPERATIONS AND HARDWARE

Includes computer graphics and data processing.

For components see *33 Electronics and Electrical Engineering.*

N86-12977# Illinois Univ., Urbana. Computer Systems Group.
A THEORY FOR ALGORITHM-BASED FAULT TOLERANCE IN ARRAY PROCESSOR SYSTEMS M.S. Thesis
P. Banerjee 10 Dec. 1984 166 p
(AD-A156244; CSG-39) Avail: NTIS HC A08/MF A01 CSCL 09/2

The concept of algorithm-based fault tolerance deals with system-level methods for obtaining reliable results from computations, especially when performed on array processor systems. In this scheme, algorithms have their outputs encoded in a system-level error-detecting or error-correcting code. This report deals with a theoretical study of the scheme of algorithm-based fault tolerance and addresses four issues. First, it deals with some design issues of specific fault-tolerant and fault-secure schemes. Algorithms are classified into broad classes called paradigms which are determined exclusively by the communication patterns of the processors. The second part deals with the development of a model which can be used to analyze the fault-detecting and fault-locating capabilities of such algorithms. The model uses a broad interpretation of errors, faults and checks, which are represented as a tripartite graph. In the third part, some graph-theoretic bounds are presented on various useful characteristics in algorithm-based fault tolerance. The model is used to determine bounds on the number of data elements that a processor may affect while allowing t-fault detection or t-fault location. The last part deals with a probabilistic study of the scheme. Expressions for the reliability of the results of the computation, and the time for completion of the computation using a particular algorithm, are derived in terms of various parameters. GRA

N86-12978# Johns Hopkins Univ., Baltimore, Md. Dept. of Electrical Engineering and Computer Science.
FAULT TOLERANT STATISTICAL SIGNAL PROCESSING ALGORITHMS FOR PARALLEL ARCHITECTURES Final Technical Report
G. G. L. Meyer and H. L. Weinert 26 Jun. 1985 28 p
(Contract N00014-81-K-0813)
(AD-A157393) Avail: NTIS HC A03/MF A01 CSCL 09/2

We analyze the effects of hardware faults on the performance of computer-implemented signal detectors, as measured by the probability of detection and the probability of false alarm. We then use these results to design fault-tolerant detectors using hardware redundancy. GRA

N86-12979# Massachusetts Inst. of Tech., Cambridge. Lab. for Computer Science.
GENERIC SOFTWARE FOR EMULATING MULTIPROCESSOR ARCHITECTURES M.S. Thesis
R. M. Soley May 1985 99 p
(Contract N00014-75-C-0661)
(AD-A157662; MIT/LCS/TR-339) Avail: NTIS HC A05/MF A01 CSCL 09/2

The expense of designing, prototyping, and testing a new computer architecture, (particularly non-traditional supercomputer architectures, such as the dataflow machine) is enormous. The relative inflexibility of hardware to experimental changes increases the need to fully test a new architectural idea. A software architecture for prototyping and testing single and multiprocessor computer architectures is outlined. An overall design is discussed, noting the need for such a system, how it would be used to model and test various architectures, and possible implementation paths. Various extensions and uses of such a generic prototyping system are also described, including extensions for modelling shared-resource systems, centrally synchronized systems, and distributed timing simulation systems. In addition, two uses of the system are presented, in particular the Tagged Token Dataflow Architecture, noting various methods in which such a machine may be simulated under a generic emulation package.
Author (GRA)

N86-12980# Department of the Army, Washington, D. C.
CONTROL FOR DOT MATRIX PRINTERS OPERATING IN HARSH ENVIRONMENT Patent Application
S. L. Everett, Jr., inventor (to Army) Filed 6 Jun. 1985 115 p
(AD-D011846; US-Patent-Appl-SN-741940) Avail: NTIS HC A06/MF A01 CSCL 09/2

A control processing method and apparatus for DOT matrix printers which are subjected to relatively high levels of vibration and shock are discussed. Vibration and shock are detected and, in the event that a known safe vibration or shock level is exceeded, print line data being fed alternately to the print head from a pair of data print buffers coupled to the output of a logic data input buffer are inhibited while the input buffer temporarily stores the incoming data. Drive pulses applied to the stepper motor used to move the print head carriage are simultaneously stopped. When the detected level falls below a set threshold indicative of a safe operating level, normal operation is resumed with the print data again being fed from the input buffer to the print line buffers which are reactivated along with the carriage stepper motor. Additionally, any positional change of print head carriage during the existence of shock or vibration levels above the threshold value from the last valid driven position is determined and accordingly repositioned prior to continuing the printing operation upon cessation of the disturbance. Author (GRA)

N86-12981# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
THE DESIGN AND HARDWARE EVALUATION OF AN ADVANCED 16-BIT, LOW-POWER, HIGH PERFORMANCE MICROCOMPUTER SYSTEM FOR DIGITAL SIGNAL PROCESSING M.S. Thesis
G. S. Mauersberger 1985 117 p
(AD-A158130; AFIT/CI/NR-85-72T) Avail: NTIS HC A06/MF A01 CSCL 09/2

This thesis is a hardware evaluation of Rockwell International's Advanced Architecture Microprocessor (AAMP) which is a single-chip, CMOS/SOS device. The microprocessor is evaluated by designing and testing and testing an AAMP based microcomputer system. The Electrical and Computer Engineering Department at Kansas State University has an ongoing program to evaluate microprocessors and identify those with low power consumption, easy interfacing and programming, and capability of rapid multiplications. The AAMP is a microprocessor which appears to possess these qualities. It is a high-performance, 16-bit, CMOS/SOS microprocessor and operates from a 20 MHz clock. The AAMP's instruction set is well suited for compiling from high level languages, such as Jovial and Ada, and includes, and integer, fractional, and floating-point arithmetic operations. This thesis covers the AAMP's operational characteristics, the developed microcomputer system, and the evaluation process. Special emphasis is given to the aspects of the AAMP's architecture and operational characteristics which are important in the design of a microcomputer system. GRA

N86-12982# Sandia National Labs., Albuquerque, N. Mex.
CURRENT CIM ACTIVITIES IN THE MATERIALS PROCESS ENGINEERING AND FABRICATION DIRECTORATE 7400
P. Plomp 28 Nov. 1985 4 p
(Contract DE-AC04-76DP-00789)
(DE85-015491; SAND-84-1472) Avail: NTIS HC A02/MF A01

The Sandia Process Engineering and Fabrication (P/F) Directorate, 7400, is steadily procuring and installing computer controlled manufacturing and inspection equipment. To program this equipment effectively and to take maximum advantage of the Sandia engineering design database, a network of VAX computers and a set of high performance color graphics terminals are proposed. This report briefly explains this program. DOE

N86-12983# Argonne National Lab., Ill.
MANAGING PERSONAL DESKTOP COMPUTING AT ARGONNE NATIONAL LABORATORY
D. W. Coultis and M. A. Gallo 1985 14 p Presented at the Conf. of the ACM SIGUCCS User Services Pulling It All Together, Toledo, 30 Sep. 1985
(Contract W-31-109-eng-38)
(DE85-014976; CONF-8509140-1) Avail: NTIS HC A02/MF A01

The increasing number of personal desktop computer users, coupled with rapidly changing personal desktop computer technology, has increased the demand for computing services at many computing centers. However, for many computing centers, budgets have not increased as rapidly as the demand for services. These centers can use several methods to help balance increasing demands and fixed resources. Providing personal desktop computing recommendations and encouraging users to follow them are effective means of meeting demands for computing services, even while operating within a constant or slowly growing budget. Providing personal desktop computing recommendations reduces evaluation costs, shifts the burden of evaluating personal desktop computing products, and encourages expertise. Making the acquisition of personal desktop computer hardware and software easier benefits the user, as well as the computing center. Users receive evaluated products for which they can obtain assistance from the computing center, while computing centers encourage the use of recommended products. Computing centers can also encourage and nurture personal desktop computing users groups. These users groups identify areas of need, participate in the evaluation process, and help reduce the demand for computing center resources. This paper discusses issues associated with managing personal desktop computing, proposes guidelines for instituting a management program, and discusses our experiences with managing personal desktop computing at Argonne National Laboratory. DOE

N86-12984# Argonne National Lab., Ill.
DAPHNE: THE DESIGN OF A PARALLEL MULTIPROCESSOR DATA ACQUISITION SYSTEM
R. T. Daly, T. H. Moog, and L. C. Welch 1985 6 p Presented at the 4th Topical Conf. on Computerized Data Acquisition in Particle and Nucl. Phys., Chicago, 19 May 1985
(Contract W-31-109-eng-38)
(DE85-013875; CONF-850579-12) Avail: NTIS HC A02/MF A01

The DAPHNE data acquisition system is designed to collect data at high rates from CAMAC instruments and to analyze the data on-line with multiple single board computers using the National 32016 microprocessor. It will be the standard data acquisition system used on all instruments at the Argonne Tandem-Linac Accelerator (ATLAS), a heavy ion accelerator. The system includes a programmable event handler to acquire the data from CAMAC instruments, event processors operating in parallel to analyze the data, an event distributor to supply the data to the parallel processors, and an intelligent event processor interface to control the event processors and transfer data between the host computer and the event processors. Functional characteristics of each of these system components are discussed and the design of the custom event distributor and intelligent event processor interface will be described in detail. DOE

N86-12985# Los Alamos Scientific Lab., N. Mex.
DATA ACQUISITION INTERFACES FOR THE IBM PERSONAL COMPUTER
F. McGirt and K. Moore May 1985 11 p
(Contract W-7405-eng-36)
(DE85-014256; LA-10432-MS) Avail: NTIS HC A02/MF A01

Data acquisition interfaces composed of standard bus structures such as CAMAC and IEEE-488 have been used with the IBM personal computer (PC). These interfaces have proved to be invaluable for applications that require automation of laboratory and field experiments and laboratory development station. Software libraries have been developed to provide easy access to these interfaces from high level programming languages such as C. DOE

N86-12986# Los Alamos Scientific Lab., N. Mex.
THE 32-BIT COMPUTER FOR LARGE MEMORY APPLICATIONS ON FASTBUS
J. M. Blossom, J. P. Hong, and R. G. Kellner 1985 4 p Presented at the 4th Topical Conf. on Computerized Data Acquisition in Particle and Nucl. Phys., Chicago, 19 May 1985
(Contract W-7405-eng-36)
(DE85-012726; LA-UR-85-1733; CONF-850579-4) Avail: NTIS HC A02/MF A01

A FASTBUS based 32 bit computer is being built at Los Alamos National Laboratory for use in systems requiring large fast memory in the FASTBUS environment. A separate local execution bus allows data reduction to proceed concurrently with other FASTBUS operations. The computer, which can operate in either master or slave mode, includes the National Semiconductor NS32032 chip set with demand paged memory management, floating point slave processor, interrupt control unit, timers, and time of day clock. The 16.0 megabytes of random access memory are interleaved to allow windowed direct memory access on and off the FASTBUS at 80 megabytes per second. DOE

N86-12987# Lister Hill National Center for Biomedical Communications, Bethesda, Md.
SYSTEMS FOR AUTHORING COMPUTER-BASED INSTRUCTION
C. Locatis and V. Carr Jan. 1985 68 p refs
(PB85-198950; LHNCBC-85-1) Avail: NTIS HC A03/MF A01 CSCL 09B

A three part report that provides an overview to authoring system technology is discussed. In part one, the technology is described and evaluation concepts and procedures are introduced. In part two, descriptive summaries of several systems are presented. Part three contains a keyword descriptive listing of over 80 systems. The focus is on systems that are primarily microcomputer based. GRA

N86-12988# National Bureau of Standards, Gaithersburg, Md. Center for Programming Science and Technology.

USING THE INFORMATION RESOURCE DICTIONARY SYSTEM COMMAND LANGUAGE Final Report
A. Goldfine Apr. 1985 86 p
(PB85-227783; NBSIR-85/3165) Avail: NTIS HC A05/MF A01 CSCL 09B

The document introduces and provides examples of the Command Language of the draft proposed Information Resource Dictionary System (IRDS). A dictionary maintained by the U.S. Air Force is defined in the IRDS and used as a continuing example throughout the document. The dictionary is populated, manipulated; and reported on using the precise syntax of the Command Language. An appendix to the document provides a complete listing of the creation of the example. Other appendices provide indices of all command appearances and all clause appearances. GRA

N86-12406# Joint Publications Research Service, Arlington, Va.
THE 4-BIT MICROPROCESSOR CAPABILITIES, APPLICATIONS DESCRIBED
Miao Xiaosheng *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-035) 17 Oct. 1985 p 73-87 Transl. into ENGLISH from Dianzi Jishu Yingyong (Beijing), no. 5, 25 May 1985 p 40-45 (For primary document see N86-12399 03-31)
Avail: NTIS HC A08/MF A01

N86-12448# Joint Publications Research Service, Arlington, Va.
PROGRAMMER FOR SINGLE-CHIP MICROPROCESSOR
Li Benren, Gong Ganghua, and Meng Qi *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-029) 3 Sep. 1985 p 29-40 refs Transl. into ENGLISH from Xiaoxing Weixing Jisuanji Xitong (Shenyang), no. 1, 8 Jan. 1985 p 8-15 (For primary document see N86-12446 03-31)
Avail: NTIS HC A08/MF A01

61 COMPUTER PROGRAMMING AND SOFTWARE

Includes computer programs, routines, and algorithms.

N86-12989# Naval Biodynamics Lab., New Orleans, La.
GENERAL PLOT SUBROUTINE PACKAGE FOR THE HEWLETT PACKARD 5451C FOURIER ANALYZER
D. A. Francis Dec. 1984 88 p
(NR Proj. F58-524)
(AD-A157127; NBDL-84R008) Avail: NTIS HC A05/MF A01 CSCL 09/2

The Hewlett Packard (HP) 5451C Fourier Analyzer formerly supported two plot packages: One in the Fourier environment and one in the Real Time Executive (RTE) environment. Thus, programs which produced graphic output in the Fourier environment could not run in the RTE environment and conversely. Therefore, it was necessary to develop a standard package of plot subroutines that could run under any operating system. The package is comprised of several FORTRAN subroutines which interact directly with the plot devices, and also provide the capability to plot to the operator's terminal. The data plotting package has been found to be extremely useful for graphic output on the HP-5451C because it can run under any operating system. The plot package has been tested on the HP-5451C system and can be recommended to users with a similar need. Author (GRA)

N86-12990# Mitre Corp., Bedford, Mass.
AISIM (AUTOMATED INTERACTIVE SIMULATION MODELING SYSTEM) OVERVIEW: REVISION 1 Final Report
H. P. Schultz Mar. 1985 22 p
(Contract F19628-84-C-0001)
(AD-A157392; MTR-8707-Rev-1; ESD-TR-85-149-Rev-1) Avail: NTIS HC A02/MF A01 CSCL 09/2

A new general purpose simulation modeling tool, Automated Interactive Simulation Modeling System (AISIM), has been developed by the Air Force System Command's Electronic Systems Division and funded by Air Force Program Element 64740F, Computer Resource Management Technology. AISIM is designed to provide quick answers to system performance questions during the conceptual phase of system acquisitions. It is currently operational on IBM and VAX computers. AISIM has undergone many tests and is now in the initial operating capability phase. Results indicate potential for wide application to the study of communications nets, computer system architectures, and data processing functions. This document introduces the reader to AISIM: its model building capabilities and its functional interfaces. GRA

N86-12991# Yale Univ., New Haven, Conn. Dept. of Computer Science.
MICRO-PROUST
W. L. Johnson and E. Soloway Jun. 1985 123 p
(Contract N00014-82-K-0714)
(AD-A157505; YALEU/CSD/RR-402) Avail: NTIS HC A06/MF A01 CSCL 09/2

PROUST (Program Understander for Students) is a knowledge-based system that finds nonsyntactic bugs in Pascal programs written by novice programmers. When students compile a program successfully, PROUST is automatically invoked to analyze it. PROUST reports any bugs that are in the program to the student. PROUST is a 15,000 LISP program and runs on a VAX. Micro-PROUST is a program meant to capture the essence of PROUST. Micro-PROUST is a 1500 line LISP program and runs on an IBM PC (with 512 K). This document presents the inner workings of Micro-PROUST. Its intent is to enable those who so are inclined to see at a nuts and bolts level how a system like PROUST actually works. GRA

N86-12992# Massachusetts Inst. of Tech., Cambridge. Statistics Center.
NUMERICAL ALGORITHMS AND MATHEMATICAL SOFTWARE FOR LINEAR CONTROL AND ESTIMATION THEORY Final Report, 14 Dec. 1981 - 13 Dec. 1984
V. Klema 30 May 1985 4 p
(Contract DAAG29-82-K-0028)
(AD-A157525; ARO-18441.2-MA) Avail: NTIS HC A02/MF A01 CSCL 09/2

Research concentrated on designing and implementing a microprocessor based concurrent computing environment consisting of a number of Intel microprocessors with IEEE floating point arithmetic implemented in hardware. The major focus of our work was the design of a concurrent tasker in software to locate code can data, monitor computation and communication and report results to the user. The construction of viable numerical algebra modules in an IEEE floating point arithmetic was and continues to be part of the research. Author (GRA)

N86-12993# Stanford Univ., Calif. Systems Optimization Lab.
IMPACT OF LINEAR PROGRAMMING ON COMPUTER DEVELOPMENT
G. B. Dantzig Jun. 1985 24 p
(Contracts N00014-85-K-0343; DE-AM03-76SF00326; DE-AT03-76ER-72018; Grants NSF DMS-84-20623; NSF ECS-83-12142)
(AD-A157659; SU-SOL-85-7) Avail: NTIS HC A02/MF A01 CSCL 09/2

In the post-War period 1947 to 1952, the United States Air Force transferred considerable funds to the National Bureau of Standards to subsidize the early development of computers, and peripherals such as high speed tapes and printers. These funds, over a million dollars, help finance SEAC, SWAC UNIVAC and early research of IBM. This paper presents an intimate view of the network of colleagues of the author during this early period, their contributions, their sponsors, and why computers were needed for the solution of a broad range of planning problems. The story of how the simplex method was discovered is told once again. Author (GRA)

N86-12994# Massachusetts Inst. of Tech., Cambridge. Artificial Intelligence Lab.
ACTORS: A MODEL OF CONCURRENT COMPUTATION IN DISTRIBUTED SYSTEMS Ph.D. Thesis
G. A. Agha Jun. 1985 203 p
(Contract N00014-80-C-0505)
(AD-A157917; AI-TR-844) Avail: NTIS HC A10/MF A01 CSCL 09/2

A foundational model of concurrency is developed in this thesis. It examines issues in the design of parallel systems and show why the actor model is suitable for exploiting large-scale parallelism. Concurrency in actors is constrained only by the availability of hardware resources and by the logical dependence inherent in the computation. Unlike dataflow and functional programming, however, actors are dynamically reconfigurable and can model shared resources with changing local state. Concurrency is spawned in actors using asynchronous message-passing, pipelining, and the dynamic creation of actors. The author defines an abstract actor machine and provide a minimal programming language for it. A more expressive language, which includes higher level constructs such as delayed and eager evaluation, can be defined in terms of the primitives. Examples are given to illustrate the ease with which concurrent data and control structures can be programmed. This thesis deals with some central issues in distributed computing. Specifically, problems of divergence and deadlock are addressed. GRA

N86-12995# Army Cold Regions Research and Engineering Lab., Hanover, N. H.
A USER'S GUIDE FOR THE BIBSORT PROGRAM FOR THE IBM-PC PERSONAL COMPUTER
T. Kyriakakis and I. K. Iskandar Apr. 1985 66 p
(DA Proj. 4A1-61102-AT-24)
(AD-A157936; CRREL-SR-85-4) Avail: NTIS HC A04/MF A01 CSCL 09/2

This report is intended to provide the reader with step-by-step instructions on how to use the BIBSORT computer program on the IBM Personal Computer. THe program allows storage and retrieval of bibliographic data. The program has been tested on an IBM-XT, using DOS 1.1 or 2.1. The program requires a monitor and a printer. This user's guide discusses how to prepare diskettes to enter the data, how to name categories and files, how to open categories and files, and how to enter data. The guide also shows how to sort and store data, edit, delete, or append the data, and how to obtain a hard copy of the sorted data. Each data diskette can take up to 500 entries, assuming 512 characters per entry. A section on how to change the program to fit specific needs is presented in Appendix A, and the program listing is in Appendix B. GRA

N86-12996# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
A META SYSTEM FOR GENERATING SOFTWARE ENGINEERING ENVIRONMENTS Ph.D. Thesis
W. L. McKnight 1985 281 p
(AD-A158102; AFIT/CI/NR-85-71D) Avail: NTIS HC A13/MF A01 CSCL 09/2

TRIAD is a generic meta environment that has a knowledge base of methods from which a user can select a method to customize the TRIAD environment into a specific software environment. When a method is selected to customize the TRIAD environment, it becomes an instantiated method which provides guidelines and enforcement policies for developing and recording project information. The main contribution of this dissertation is in developing a kernel tool for TRIAD. This tool called the tuner can create method representations for the knowledge base of methods and can transform method representations already in the knowledge base of methods. The tuner is a parser generator like tool. However, instead of building representations in a batch and static mode, the tuner is able to create and transform the method representation in an incremental and dynamic way. Even when a method is instantiated and a part of the TRIAD environment, the method representation can be transformed. Methods are modeled by attributed grammar forms. A genesis grammar form was developed which can be used to generate all other grammar forms. The tuner is built upon the model of the genesis grammar form. The tuner is able to reflect experience gained with using a method back into the method by program transformation on the method representation. The power of the tuner is illustrated by three examples discussed in the dissertation. Problems discovered while implementing the three examples that are associated with designing interfaces for software environment are also discussed. GRA

N86-12997# Argonne National Lab., Ill.
AUTOMATED REASONING AND VARIOUS APPLICATIONS
L. Wos 1985 17 p Presented at the Autotestcon Conf., Long Island, N.Y., 22 Oct. 1985
(Contract W-31-109-eng-38)
(DE85-014998; CONF-8510116-1) Avail: NTIS HC A02/MF A01

Automated reasoning has reached an important goal - the design and implementation of a computer program that functions as a valuable automated reasoning assistant. Automated reasoning assistants are currently used to verify properties of other computer programs, design and validate logic circuits, solve problems in control systems and robotics, and answer open questions in mathematics. Of the various reasoning programs, the most flexible is ITP, a program written in PASCAL and offering the user many different options for attacking problems. The options include various types of reasoning, diverse strategies for restricting the reasoning and for directing it according to the user's knowledge and intuition, and auxiliary procedures that contribute to effectiveness. ITP can be used in interactive mode and in batch mode. It has been ported to various machines including the VAX, IBM 3033, PERQ, Apollo, Ridge, and Sun. The program is now being used by more than 100 institutions for research and for diverse applications. DOE

N86-12998# Los Alamos National Lab., N. Mex.
GUIDELINES FOR A THERMOCHEMICAL KINETICS COMPUTER PROGRAM
J. L. Janney and R. N. Rogers 1985 9 p Presented at the 14th North Am. Thermal Anal. Soc. Conf., San Francisco, 1 Sep. 1985
(Contract W-7405-eng-36)
(DE85-015671; LA-UR-85-2373; CONF-8509144-1) Avail: NTIS HC A02/MF A01

Guidelines are given for an interactive computer program that will analyze thermochemical decomposition rate data obtained by isothermal differential-scanning calorimetry. Data from any portion of the rate curve may be analyzed, and either normal or autocatalytic rate laws may be used. The computer calculates and displays normalized data listings, rate curves, order plots, and autocatalytic rate law plots. It calculates rate constants by linear regression treatment of data from curve segments chosen by the user. Many options are available, and many forms of the rate laws may be selected. This program was designed primarily for research rather than routine use. DOE

N86-12999# Pacific Northwest Lab., Richland, Wash.
MANAGING DATA ANALYSIS THROUGH SAVE-STATES
P. J. Cowley and M. A. Whiting Apr. 1985 8 p Presented at the 17th Symp. on the Interface of Computer Sci. and Statist., Lexington, Ky., 17 Mar. 1985
(Contract DE-AC06-76RL-01830)
(DE85-012456; PNL-21-13023; CONF-8503116-2) Avail: NTIS HC A02/MF A01

Data analysis management is a methodology intended to increase the productivity of the data analyst. A primary entity for data analysis mangement is the save-state, collection of metadata and data that captures a state of the analysis. The analyst may create a save-state to designate a milestone of the analysis. The save-state may be used later to return to that milestone by restoring the conditions of the analysis that existed at the time the save-state was created. Scientists at Pacific Northwest Laboratory (PNL) have developed a prototype data analysis management system. In that system, a save-state includes pointers to the data sets and command procedures active at the time the save-state was

created, active plot descriptions and other graphics parameters, and comments supplied by the analyst. Associated with each save-state is a record of the sequence of commands or operations used to accomplish the transition from the previous (parent) save-state. Metadata also describes the overall relationships between the save-states that have been created during the analysis. DOE

N86-13000# Oak Ridge National Lab., Tenn.
UNCERTAINTY PROPAGATION FROM RAW DATA TO FINAL RESULTS
N. M. Larson 1985 5 p Presented at the Intern. Conf. on Nucl. Data for Basic and Appl. Sci., Santa Fe, N. Mex., 13 May 1985
(Contract DE-AC05-84OR-21400)
(DE85-011937; CONF-850507-11) Avail: NTIS HC A02/MF A01

Reduction of data from raw numbers (counts per channel) to physically meaningful quantities (such as cross sections) is in itself a complicated procedure. Propagation of experimental uncertainties through that reduction process has sometimes been perceived as even more difficult, if not impossible. At the Oak Ridge Electron Linear Accelerator, a computer code ALEX has been developed to assist in the propagation process. The purpose of ALEX is to carefully and correctly propagate all experimental uncertainties through the entire reduction procedure, yielding the complete covariance matrix for the reduced data, while requiring little additional input from the experimentalist beyond that which is needed for the data reduction itself. The theoretical method used in ALEX is described, with emphasis on transmission measurements. Application to the natural iron and natural nickel measurements of D.C. Larson is shown. DOE

N86-13001# Rockwell International Corp., Richardson, Tex.
MAGNUM-2D COMPUTER CODE: USER'S GUIDE
R. L. England, N. W. Kline, K. J. Ekblad, and R. G. Baca Jan. 1985 176 p refs
(Contract DE-AC06-77RL-01030)
(DE85-013315; RHO-BW-CR-143P) Avail: NTIS HC A09/MF A01

Information relevant to the general use of the MAGNUM-2D computer code is presented. This computer code was developed for the purpose of modeling (i.e., simulating) the thermal and hydraulic conditions in the vicinity of a waste package emplaced in a deep geologic repository. The MAGNUM-2D computer computes: (1) the temperature field surrounding the waste package as a function of the heat generation rate of the nuclear waste and thermal properties of the basalt, and (2) the hydraulic head distribution and associated groundwater flow fields as a function of the temperature gradients and hydraulic properties of the basalt. MAGNUM-2D is a two dimensional numerical model for transient or steady state analysis of coupled heat transfer and groundwater flow in a fractured porous medium. The governing equations consist of a set of coupled, quasilinear partial differential equations that are solved using a Galerkin finite element technique. A Newton-Raphson algorithm is embedded in the Galerkin functional to formulate the problem in terms of the incremental changes in the dependent variables. Both triangular and quadrilateral finite elements are used to represent the continuum portions of the spatial domain. Line elements may be used to represent discrete conduits. DOE

N86-13002# George Washington Univ., Washington, D.C. Dept. of Electrical Engineering and Computer Science.
SCIENTIFIC WORKSTATION RESEARCH Annual Report, Aug. 1984 - Jul. 1985
J. D. Foley May 1985 6 p
(Contract DE-AS05-83ER-13122)
(DE85-013385; DOE/ER-13122/T1; AR-2) Avail: NTIS HC A02/MF A01

During the past year we have continued to develop key concepts needed in graphics programming languages. The overall language structure consists of geometric modeling, viewing, interaction management, and display management subsystems. Within each area, we have been developing descriptions of the semantic capabilities required. Several important themes run through these capabilities. The themes are important because they will form the basis for constructs in the programming language. One of the themes is that of dynamic links. Links maintain dependencies between data variables (which might include graphic/geometric objects). Thus, when variable A changes, so too do the other variables which have functional dependencies on A. Another theme is that of coordinate system. It seems natural that a graphics language deal with coordinate systems, and declare an object's coordinate system as one of its attributes. We then use another theme, that of a transformer, to relate one coordinate system to another. Transformers are useful in input (to relate the coordinate system of a mouse or tablet to the world coordinate system), and in viewing (to relate world coordinates to the screen). Another concept used is that of additional dimensions as a means of specifying attributes. The intensity of a point, for example, is just another (non-geometrical) coordinate of the point. By treating attributes in this way, the attribute values can be operated on by transformers; a separate language construct is not needed. DOE

N86-13003# George Washington Univ., Washington, D.C. Dept. of Electrical Engineering and Computer Science.
IMAGYS GRAPHICS PROGRAMMING LANGUAGE: DESCRIPTION AND ANALYSIS
J. B. Acquah and J. D. Foley 15 Nov. 1985 57 p
(Contract DE-AS05-83ER-13122)
(DE85-013384; DOE/ER-13122/2) Avail: NTIS HC A04/MF A01

IMAGYS (Interactive Modelling and Graphics System) is a high-level modelling and graphics programming language being developed at GWU. The language is designed to considerably reduce the difficulty of writing highly interactive engineering-oriented graphics programs, and is based on the paradigms of object-oriented systems and functional, or value-oriented systems. Although these are generally considered alternative approaches to designing languages, they are combined in IMAGYS to produce a language which we believe combines the best features of both and has few of the drawbacks of either. DOE

N86-13004# Sandia National Labs., Albuquerque, N. Mex.
GRAFAID: AN ENGINEERING TOOL
C. R. Adams 1985 29 p Presented at the 41st Meeting of the IMOG Subgroup on Environ. Testing, Miamisburg, Ohio, 18 Jun. 1985
(Contract DE-AC04-76DP-00789)
(DE85-013115; SAND-85-1325C; CONF-8506117-1) Avail: NTIS HC A03/MF A01

The GRAFAID code is an interactive X-Y data tool developed for use on the digital equipment corporation (DEC) VAX computers that use DEC's VAX/VMS operating system. The code was initially developed for the analysis and comparison of shock and vibration data for the generation of weapons component specifications, but has since evolved into a more general purpose data summary and analysis tool. The GRAFAID provides an interactive capability for simultaneously plotting and comparing multiple sets of X-Y data. The GRAFAID has various X-Y data analysis, manipulation, and creation capabilities. A direct access data base for storing sets of X-Y data and their plot definitions is created and maintained by GRAFAID. A neutral file system is provided for communicating X-Y data into, and out of, a GRAFAID data base. DOE

N86-13005# Sandia National Labs., Albuquerque, N. Mex.
SECOND REFERENCE CALCULATION FOR THE WIPP
L. J. Branstetter Mar. 1985 53 p refs
(Contract DE-AC04-76DP-00789)
(DE85-013180; SAND-83-2461) Avail: NTIS HC A04/MF A01

Results of the second reference calculation for the Waste Isolation Pilot Plant (WIPP) project using the dynamic relaxation finite element code SANCHO are presented. This reference calculation is intended to predict the response of a typical panel of excavated rooms designed for storage of nonheat producing nuclear waste. Results are presented that include relevant deformations, relative clay seam displacements, and stress and strain profiles. This calculation is a particular solution obtained by

a computer code, which has proven analytic capabilities when compared with other structural finite element codes. It is hoped that the results presented here will be useful in providing scoping values for defining experiments and for developing instrumentation. It is also hoped that the calculation will be useful as part of an exercise in developing a methodology for performing important design calculations by more than one analyst using more than one computer code, and for defining internal Quality Assurance (QA) procedures for such calculations. DOE

N86-13006# Oak Ridge National Lab., Tenn.
TANDEM MIRROR REACTOR SYSTEMS CODE (TMRSC)
R. L. Reid, K. E. Rothe, and R. J. Barrett 1985 7 p Presented at the 6th Topical Meeting on the Technol. of Fusion Energy, San Francisco, 3 Mar. 1985 Prepared in cooperation with Burns and Roe, Inc., Oak Ridge, Tenn.
(Contract DE-AC05-84OR-21400)
(DE85-012891; CONF-850310-103) Avail: NTIS HC A02/MF A01

This paper describes a computer code developed to model a tandem mirror reactor. This is the first tandem mirror reactor model to couple the highly linked physics, magnetics, and neutronic analysis into a single code. Results from this code for two sensitivity studies are included in this paper. These studies are designed: (1) to determine the impact of center cell plasma radius, length, and ion temperature on reactor cost and performance at constant fusion power, and (2) to determine the impact of reactor power level on cost. DOE

N86-13007# Sandia National Labs., Albuquerque, N. Mex.
APPLICATION OF A BINARY CYCLIC ERROR-CORRECTING CODE
K. L. Hiebert-Dodd May 1985 32 p
(Contract DE-AC04-76DP-00789)
(DE85-013232; SAND-85-0129) Avail: NTIS HC A03/MF A01

The purpose of this report is to explain the choice and implementation of a particular error correcting code. Error correcting codes are a signal processing technique that is used to improve the reliability of communication on digital channels. DOE

N86-13008# Hanford Engineering Development Lab., Richland, Wash.
APPLICATION OF AUTOMATED REASONING SOFTWARE PROCEDURE GENERATION SYSTEM VERIFIER
D. E. Smith and S. E. Seeman Sep. 1984 4 p refs Presented at ANS/ENS Fast Reactor Safety Meeting, Knoxville, Tenn., 21 Apr. 1985
(Contract DE-AC06-76FF-02170)
(DE85-014000; HEDL-SA-3214-FP; CONF-850410-58) Avail: NTIS HC A02/MF A01

An on-line, automated reasoning software system for verifying the actions of other software or human control systems has been developed. It was demonstrated by verifying the actions of an automated procedure generation system. The verifier uses an interactive theorem prover as its inference engine with the rules included as logic axioms. Operation of the verifier is generally transparent except when the verifier disagrees with the actions of the monitored software. Testing with an automated procedure generation system demonstrates the successful application of automated reasoning software for verification of logical actions in a diverse, redundant manner. A higher degree of confidence may be placed in the verified actions gathered by the combined system. DOE

N86-13009# Lawrence Livermore National Lab., Calif.
DATA STRUCTURES AND VECTORIZATION IN A TWO-DIMENSIONAL FREE-LAGRANGIAN CODE
R. E. Cooper 1 Mar. 1985 13 p Presented at the Free-Langrangian Methods Conf., Hilton Head Island, S. Car., 4 Mar. 1985
(Contract W-7405-eng-48)
(DE85-012948; UCRL-92390; CONF-8503139-1) Avail: NTIS HC A02/MF A01

The data structures used to define the mesh, drive and the physics calculations of a 2-D Free Lagrangian hydro code are described. The mesh contains three and four sided zones but the data structures can be generalized to support n-sided zones. The mesh is redundantly described by three different data structures: zone oriented, node oriented, and edge oriented. Physics algorithms, graphics routines, and reconnection algorithms use the data structure that is easiest to use or that results in the best execution rate. On the Cray computer, these data structures are sufficient to vectorize most of the physics algorithms. The basic vectorization methods will be discussed. From experience, given a physics algorithm, a data structure can be constructed that will vectorize the algorithm. DOE

N86-13010# Sandia National Labs., Albuquerque, N. Mex.
CONTROL OF STEP SIZE AND ORDER IN EXTRAPOLATION CODES
L. F. Shampine Apr. 1985 33 p refs
(Contract DE-AC04-76DP-00789)
(DE85-013261; SAND-85-0725) Avail: NTIS HC A03/MF A01

Extrapolation of the semi-implicit midpoint rule is an effective way to solve stiff initial value problems for a system of ordinary differential equations. The theory of the control of step size and order is advanced by investigating questions not taken up before, providing additional justification for some algorithms, and providing support for procedures not properly justified by the information theory of Deuflhard. An experimental code SIMP implementing the algorithms proposed is shown to be as good as, and in some respects much better than, the research code METAN1 of Bader and Deuflhard. DOE

N86-13011# Sandia National Labs., Albuquerque, N. Mex.
FDSC: A MICROWAVE COUPLING CODE FOR SLOTS OF FINITE DEPTH
L. D. Bacon Apr. 1985 6 p
(Contract DE-AC04-76DP-00789)
(DE85-013443; SAND-85-0561) Avail: NTIS HC A02/MF A01

Joints of narrow cracks in systems that serve as ports of entry for electromagnetic waves are normally modeled as slots in an infinitesimally thick conducting surface. Although this model works well at lower frequencies, it is questionable in the microwave region, where conductor thickness can be a nonnegligible fraction of a wavelength. Measurements have shown that conductor depth does have a significant effect on the transmission properties of slots, changing both the amplitude and the resonant frequencies from those predicted by zero depth codes. This report discusses an implementation of a moments code that directly accounts for finite conductor thickness. The code indicates that slot depth has a significant effect on transmission properties. For example, resonances due to depth are found that greatly enhance the transmission at frequencies that are not directly related to slot length. These results are validated by slot transmission measurements. DOE

N86-13012# Sandia National Labs., Albuquerque, N. Mex.
DESIGN AND USE OF DIGITAL FILTERS WITH PERSONAL COMPUTER SPREADSHEET PROGRAMS
D. E. Ryerson Jun. 1985 53 p
(Contract DE-AC04-76DP-00789)
(DE85-013805; SAND-85-1073) Avail: NTIS HC A04/MF A01

Spreadsheet programs for personal computers were designed for financial analysis but have also become very useful in engineering design and analysis. This report discusses the use of spreadsheets in designing digital filters, filtering digital data, and plotting the results. DOE

N86-13013# New York Univ., New York. Inst. of Mathematical Sciences.
PROGRAM FOR SIMPLE ALGEBRA
D. Stevens Mar. 1985 44 p
(Contract DE-AC02-76ER-03077)
(DE85-013426; DOE/ER-03077/239) Avail: NTIS HC A03/MF A01

PFSA (Program For Simple Algebra) is designed to be helpful to people doing algebra and calculus with polynomial expressions. It is written entirely in FORTRAN and hence is portable and easily modified. It is much (approximately 90 times) faster than Macsyma, PFSA uses FORTRAN integer arithmetic to compute coefficients, and so the occurrence of an excessively large number in a numerator or denominator during a computation bombs the computation. The program was developed to enable a computation (of a canonical transformation for a Hamiltonian system) which was too big to be run in other systems available at the time. The intent in creating PFSA was to make a program which would do the Hamiltonian computation and similar computations easily and fast. The only language available (on the Cray) was FORTRAN. Example C in Section 3 is a very simple canonical transformation. In running the problem for which PFSA was written some intermediate expressions have more than 20,000 terms and some answers have more than 1000 terms. DOE

N86-13014# Sandia National Labs., Albuquerque, N. Mex.
SCREAMER: A SINGLE-LINE PULSED-POWER DESIGN TOOL
M. I. Kiefer and M. M. Widner 1985 12 p Presented at the 5th IEEE Pulsed Power Conf., Washington, D.C., 10 Jun. 1985
(Contract DE-AC04-76DP-00789)
(DE85-012837; SAND-84-2402C; CONF-850616-28) Avail: NTIS HC A02/MF A01

SCREAMER is a special purpose circuit code developed as a design tool for single module accelerations. It is fast, accurate, flexible, and user friendly. Its development was motivated by the excessive costs and long turn around times incurred when using the SCEPTRE circuit analysis code to perform simulations of circuits with large numbers of nodes and with nonlinear components. Comparable simulations between SCREAMER running on a VAX 11/780 and SCEPTRE running on a CRAY-1S show that turn around times and costs can be two orders of magnitude lower when using SCREAMER. DOE

N86-13015# Argonne National Lab., Ill.
PARALLEL IMPLEMENTATION OF MULTIFRONTAL SCHEMES
I. S. Duff Mar. 1985 19 p
(Contract W-31-109-eng-38)
(DE85-014295; ANL/MCS-TM-49) Avail: NTIS HC A02/MF A01

The direct solution of large sparse sets of linear equations in an MIMD environment is considered. Algorithm are based on a multifrontal approach and shwos how to distribute tasks among processors according to an elimination tree that can be automatically generated from any pivot strategy. Organizational aspects of the scheme for shared memory multiprocessor configurations are studied and implications for multiprocessors with local memories and a communication network are considered. DOE

N86-13016# Sandia National Labs., Albuquerque, N. Mex.
FUNDAMENTALS OF ADAPTIVE SIGNAL PROCESSING
S. D. Stearns Jun. 1985 42 p
(Contract DE-AC04-76DP-00789)
(DE85-014933; SAND-84-2646) Avail: NTIS HC A03/MF A01

This report describes some of the basic concepts of adaptive signal processing, including a summary of applications, the mean square error performance surface, adaptive search methods, the LMS algorithm, and the adaptive lattice. It is intended primarily to be a short review of the subject for engineers at Sandia National Laboratories. DOE

N86-13017# Los Alamos Scientific Lab., N. Mex.
ATTEMPT TO DEVELOP AN INTELLIGENT LENS DESIGN PROGRAM
V. K. Viswanathan, I. O. Bohachevsky, and T. P. Cotter 1985 13 p refs Presented at the Intern. Lens Design Conf., Cherry Hill, N.J., 10 Jun. 1985
(Contract W-7405-eng-36)
(DE85-014122; LA-74-85-2035; CONF-8506142-2) Avail: NTIS HC A02/MF A01

A Lens Design Program intended to operate without user intervention, and to improve its performance with repeated usage is being developed. The methodology and current status is discussed in this paper. DOE

N86-13018# Sandia National Labs., Albuquerque, N. Mex.
BUILDING VERSATILE TAPE HANDLING SOFTWARE
E. L. Witzke 1985 14 p Presented at the ISE Conf., Albuquerque, N. Mex., 7 May 1985
(Contract DE-AC04-76DP-00789)
(DE85-009333; SAND-85-7174C; CONF-8505177-2) Avail: NTIS HC A02/MF A01

This paper presents solutions to some of the problems involved in building versatile tape handling software. These problems were discovered while designing and implementing a media conversion facility for Sandia National Laboratories. Following a description of the purpose and capabilities of the Sandia Media Conversion and Labeling Center, the three major design problems and their solutions will be discussed. The first problem was the many possible combinations of tracks, densities, parities, and code sets, not all of which are valid. The second problem was translating one code set into another without developing N(2) translation routines. The third problem was handling the multitude of labeling combinations that can arise. Also described is how the technologies used on the Media Conversion and Labeling Center software apply to other applications. DOE

N86-13019# Los Alamos Scientific Lab., N. Mex.
DATA ACQUISITION COMMAND INTERFACE USING VAX/VMS DCL
R. V. Poore, D. M. Barrus, G. Cort, J. A. Goldstone, L. B. Miller, and R. O. Nelson 1985 10 p Presented at the 4th Topical Conf. on Computerized Data Acquisition in Particle and Nucl. Phys., Chicago, 19 May 1985
(Contract W-7405-eng-36)
(DE85-012747; LA-UR-85-1757; CONF-850579-8) Avail: NTIS HC A02/MF A01

The user interface to a data acquisition system is being developed at the Los Alamos Weapons Neutron Research Facility using the VAX/VMS command language interface DCL. Commands are being implemented which provide for system initialization and control functions and FASTBUS diagnostics. The data acquisition system incorporates the concept of a data acquisition state (running, halted, etc.) where a certain subset of input commands is allowed. DOE

N86-13020# Oak Ridge National Lab., Tenn.
TWOPOT: A COMPUTER MODEL OF THE TWO-POT EXTRACTIVE DISTILLATION CONCEPT FOR NITRIC ACID
R. T. Jubin, W. D. Holland, R. M. Counce, and D. R. Beckwith May 1985 71 p refs
(Contract DE-AC05-84OR-21400)
(DE85-013523; ORNL/TM-9241) Avail: NTIS HC A04/MF A01

A mathematical model, TWOPOT, of the two-pot extractive distillation concept for nitric acid concentration has been developed. Prediction from a computer simulation using this model shows excellent agreement with the experimental data. This model is recommended for use in the design of large-scale, similar-purpose equipment. DOE

N86-13021# Detroit Diesel Allison, Indianapolis, Ind. Gas Turbine Div.
USER'S MANUAL FOR USING MASON: A FREQUENCY RESPONSE PROGRAM WHICH HANDLES A SYSTEM OF TRANSFER FUNCTIONS DESCRIBED BY A SIGNAL FLOW GRAPH
L. C. Boger Jul. 1985 100 p
(PB85-227106; DDAD/EDR-11187; NTIS/SW/MT-85/001A) Avail: NTIS HC A05/MF A01 CSCL 09B

MASON is a frequency response computer program useful in the design and analysis of linear control systems. Complex signal flowgraphs involving either Laplace Transform or Z-Transform transmittances are reduced via a computational algorithm based on Mason's Gain Formula. Continuous time systems are evaluated with s=jw and discrete line systems use z=exp(sT). The transmittances may include polynomial expressions, transport tags or actual

gain/phase data from experimental testing. The input structure is user oriented providing for simple transfer function representation between nodes. Frequency response, resonant peak, resonant frequency and gain and phase margin are calculated where appropriate and form the program output. GRA

N86-12388# Tohoku Univ., Sendai (Japan). Research Inst. of Electrical Communication.
A METHODOLOGY FOR SYNTAX-ANALYSIS USING PROLOG
Takahika Murayama, Yoshiyuki Kawazoe, and Yoshiharu Shigei *In its* The Record of Elec. and Commun. Eng. Conversazione, Vol. 54, No. 1 Aug. 1985 p 26-30 refs In JAPANESE; ENGLISH summary (For primary document see N86-12383 03-31)
Avail: NTIS HC A03/MF A01

62 COMPUTER SYSTEMS

Includes computer networks.

N86-13022# Naval Postgraduate School, Monterey, Calif.
DESIGN AND IMPLEMENTATION OF THE COMPUTER SYSTEMS DESIGN ENVIRONMENT NETWORK M.S. Thesis
J. L. Poole Mar. 1985 93 p
(AD-A156832; AD-E301723) Avail: NTIS HC A05/MF A01 CSCL 09/2

This thesis develops and implements a computer network for the Computer System Design Environment (CSDE). The CSDE network is based upon the use of the Zenith-100 (Z100) computer as an intelligent workstation. The Z100 provides direct communication with the VAX 11/780 mainframe and Prolog computer systems. Included on line in the Z100 workstation is a users manual which describes network operations. The users manual is designed to take the first-time CSDE user through all phases of the CSDE process in a step-by-step manner. Author (GRA)

N86-13023# Lawrence Livermore National Lab., Calif.
ROLE OF SUPERCOMPUTERS IN MAGNETIC FUSION AND ENERGY RESEARCH PROGRAMS
J. Killeen Jun. 1985 22 p
(Contract W-7405-eng-48)
(DE85-013200; UCRL-92792) Avail: NTIS HC A02/MF A01

The importance of computer modeling in magnetic fusion (MFE) and energy research (ER) programs is discussed. The need for the most advanced supercomputers is described, and the role of the National Magnetic Fusion Energy Computer Center in meeting these needs is explained. DOE

N86-13024# Lawrence Livermore National Lab., Calif.
LABNET PROJECT PLAN
G. Pavel 24 Jun. 1985 41 p
(Contract W-7405-eng-48)
(DE85-014860; UCID-20471) Avail: NTIS HC A03/MF A01

LabNet value-added service is a high-speed packet-switched network that ties computers together. From the point-of-view of a single computer, or of a local network of computers within a building or a group of buildings, the LabNet high-speed network is a long-haul network (like Tymnet or ARPANET) for getting to other buildings. This service is provided through channels of the backbone that are shared by everyone at the Laboratory. The focus of the high-speed network is the efficient transfer of data between computers as opposed to the interconnection of people's terminals to these computers. The latter function is best served by the local networks, or by a separate network. DOE

63 CYBERNETICS

Includes feedback and control theory.

For related information see also *54 Man/System Technology and Life Support.*

N86-13025# Air Force Human Resources Lab., Brooks AFB, Tex.
ARTIFICIAL INTELLIGENCE IN Ada: PATTERN-DIRECTED PROCESSING Final Report
L. H. Reeker, J. Kreuter, and K. Wauchope May 1985 45 p
(AD-A157097; AFHRL-TR-85-12) Avail: NTIS HC A03/MF A01 CSCL 09/2

If the programming language Ada is to be widely used in artificial intelligence applications, it will be necessary to demonstrate to programmers that it can provide superior facilities for use in that domain. One means of doing this is to provide facilities for pattern-directed programming within Ada. This report includes three papers, of which the first is designed to serve as an introduction to pattern-directed programming and to the significance of the two papers that follow. It includes discussions of artificial intelligence programming and the facilities provided by the Ada language, pattern-directed computation, pattern matching, and parsing. The other two papers deal with the use of Ada for pattern-directed programming. One paper deals with efficient implementation of pattern matching (within Ada), important because pattern matching tends to be inefficient, leading to problems with excessive processing time. Another paper treats extensions of pattern-direction from strings to more general data structures of the sort used in artificial intelligence. Author (GRA)

N86-13026# Perceptronics, Inc., Ann Arbor, Mich.
PILOT'S ASSOCIATE DEFINITION STUDY Final Report, Jul. 1984 - May 1985
R. G. Eisenhardt, G. H. Eisenhardt, and D. Z. Douthat May 1985 139 p
(Contract MDA903-84-C-0329; ARPA Order 5116)
(AD-A157106; FR2213U/4577) Avail: NTIS HC A07/MF A01 CSCL 15/7

Air combat operational and technological problems in the 1995 technology time frame are analyzed for application of artificial intelligence technology under the DARPA's Strategic Computing Program. Operational missions are examined to identify those functions most critical for mission success. Applicable technology is reviewed including sources other than the SCP. A case is made for application of information processing architectural concepts new to airborne weapon systems, but matured in other disciplines over several decades, to accommodate AI technology. Such architecture are developed and reviewed. Onboard information processing hierarchies are developed to support mission requirements for both air-to-air and air-to-ground missions. These are then grouped into five processors, including a pilot/vehicle interface, to transition from the output of sensor signal processing to highly symbolic information for presentation to the pilot/crew. These processors are a Situation Awareness Manager to develop and maintain a current world model external to the airplane, a System Status Manager to perform the same function for the world inside the plane, a Tactical Manager to assess tactical implications of the world and make recommendations to the pilot for action, and a Mission Manager to evaluate mission plans vis-a-vis current situation and assist the pilot in revising plans as necessary. Artificial intelligence technology, both hardware and software, is reviewed and areas and degree of application efforts, measures of effectiveness (MOE) and performance (MOP) are suggested and defined. GRA

N86-13027# Allied Bendix Corp., Kansas City, Mo.
KNOWLEDGE-BASED SYSTEMS: HOW WILL THEY AFFECT MANUFACTURING IN THE 80'S
M. S. King, S. L. Brooks, and R. M. Schaefer Apr. 1985 19 p refs Presented at the ASME Intern. Computers in Eng. Conf. and Exhibition, Boston, 4 Aug. 1985
(Contract DE-AC04-76DP-00613)
(DE85-010601; BDX-613-3185; CONF-850862-1) Avail: NTIS HC A02/MF A01

Knowledge-based or expert systems have been in various stages of development and use for a long time in the academic world. Some of these systems have come out of the lab in recent years in the fields of medicine, geology, and computer system

design. The use of knowledge-based systems in conjunction with manufacturing process planning and the emerging CAD/CAM/CAE technologies promises significant increases in engineering productivity. Areas in manufacturing where knowledge-based systems could most benefit the engineer and industry are emphasized. DOE

64 NUMERICAL ANALYSIS

Includes iteration, difference equations, and numerical approximation.

N86-13028*# Drexel Univ., Philadelphia, Pa. Dept. of Mechanical Engineering and Mechanics.
RESEARCH ON OUTPUT FEEDBACK CONTROL Interim Report, Jan. - Sep. 1985
Anthony J. Calise and Friedrich S. Kramer Nov. 1985 20 p refs (Grant NAG1-243)
(NASA-CR-174253; NAS 1.26:174253) Avail: NTIS HC A02/MF A01 CSCL 12A

In designing fixed order compensators, an output feedback formulation has been adopted by suitably augmenting the system description to include the compensator states. However, the minimization of the performance index over the range of possible compensator descriptions was impeded due to the nonuniqueness of the compensator transfer function. A controller canonical form of the compensator was chosen to reduce the number of free parameters to its minimal number in the optimization. In the MIMO case, the controller form requires a prespecified set of ascending controllability indices. This constraint on the compensator structure is rather innocuous in relation to the increase in convergence rate of the optimization. Moreover, the controller form is easily relatable to a unique controller transfer function description. This structure of the compensator does not require penalizing the compensator states for a nonzero or coupled solution, a problem that occurs when following a standard output feedback synthesis formulation. G.L.C.

N86-13029# Camerino Univ. (Italy).
A NEW METHOD FOR GLOBAL OPTIMIZATION BASED ON STOCHASTIC DIFFERENTIAL EQUATIONS Final Technical Report, Dec. 1981 - Dec. 1984
F. Aluffi-Pentini, V. Parisi, and F. Zirilli Dec. 1984 282 p In ENGLISH and ITALIAN
(Contract DAJA37-81-C-0740; DA Proj. 1T1-61102-BH-57)
(AD-A157546) Avail: NTIS HC A13/MF A01 CSCL 12/1

A new approach is presented to the problem of finding a global (i.e., absolute) minimizer of a function of several real variables, and some of its mathematical properties are investigated. The approach is based on the idea of following the solution trajectories of a stochastic differential equation inspired by statistical mechanics. This document also describes a complete algorithm (SIGMA) based on the above approach, which looks for a point of global minimum by monitoring the values of the function to be minimized along a number of simultaneously-evolving trajectories generated by a new (stochastic) scheme for the numerical integration of the stochastic differential equation. Finally described is the software package SIGMA which implements the above algorithm in a portable subset of the A.N.S. FORTRAN 4 language, a number of carefully selected test problems designed for testing the software for global optimization, and the results of testing SIGMA on the above problems, and on a problem of theoretical chemistry. The main conclusion is that the performance of SIGMA is very good, even on some very hard problems. Author (GRA)

N86-13030# Naval Surface Weapons Center, Silver Spring, Md.
RELATIONSHIPS BETWEEN PRIME-RICH EULER TYPE EQUATIONS AND A TRIANGULAR ARRAY OF THE ODD INTEGERS
R. S. Sery Feb. 1985 33 p
(AD-A157928; NSWC/TR-85-120) Avail: NTIS HC A03/MF A01 CSCL 12/1

A certain triangular array of the odd integers, which is built up along successive diagonals of a rectangular grid, is correlated with equations of the form x squared-x+c, c=2n-1, n+1,2,3... where n indicates the number of the column (and also the row number for equations x squared + x - r). Primitive cell arrays are derived from the above array. Each such array consists of a prime value p(of c) which is substituted for every integer in the triangular array who is identical to 0(mod p) with all other locations corresponding to integers not identical to (mod p) left blank. Various relationships between the triangular array, the equations x squared - x + c, c=1,3,5,... and the derived primitive cell arrays are brought out. These show how: (1) Euler type prime-rich equations can be found; (2) why and how nonrandom structures exists in the way prime numbers occur in the sequence of the positive integers 1,2,3....are presented. GRA

N86-13031# Army Armament Research and Development Command, Watervliet, N. Y. Large Caliber Weapon Systems Lab.
VARIATIONAL PRINCIPLE FOR PENETRATOR DYNAMICS USING BILINEAR FUNCTIONAL AND ADJOINT FORMULATION Final Technical Report
C. N. Shen Jun. 1985 24 p Presented at 2nd Army Conf., Appl. Math. and Computing, Troy, NY, 22-24 May 1984
(AD-A157964; AD-E440290; ARLCB-TR-85021) Avail: NTIS HC A02/MF A01 CSCL 19/4

The solution to problems in both spatial and time domains using the finite element method can be based on the variational principle employing bilinear functional and adjoint formulation. The principle is extended to matrix vector coupling systems such as in penetration dynamics. The present hyperbolic type partial differential equation of interest has two dependent and two independent variables with the coupling in the spatial domain. GRA

N86-13032# Wisconsin Univ., Madison. Mathematics Research Center.
ON HIGH-ORDER ACCURATE INTERPOLATION FOR NON-OSCILLATORY SHOCK CAPTURING SCHEMES Technical Summary Report
A. Harten Jun. 1985 43 p
(Contracts DAAG29-82-C-0090; DAAG29-80-C-0041)
(AD-A158131; MRC-TSR-2829) Avail: NTIS HC A03/MF A01 CSCL 12/1

This paper describes high-order accurate Godunov-type schemes for the computation of weak solutions of hyperbolic conservation laws that are essentially non-oscillatory. It is shown that the problem of designing such schemes reduces to a problem in approximation of functions, namely that of reconstructing a piecewise smooth function from its given oscillations. To solve this reconstruction problem we introduce a new interpolation technique that when applied to piecewise smooth data gives high-order accuracy wherever the function is smooth but avoids having a Gibbs-phenomenon at discontinuities. Author (GRA)

N86-13033# Wisconsin Univ., Madison. Mathematics Research Center.
TWO RESULTS ON DENSE IMBEDDINGS Technical Summary Report
M. Renardy Jun. 1985 8 p
(Contract DAAG29-80-C-0041; Grant NSF MCS-82-15064)
(AD-A158132; MRC-TSR-2833) Avail: NTIS HC A02/MF A01 CSCL 12/1

In a recent paper J. U. Kim studied the Cauchy problem for a Bingham fluid in R sub 2. He points out that the extension of his results to R sub 3 depends on two lemmas concerning dense imbedding of C sub 0 infinity functions in certain spaces. In this paper these lemmas are proved. Author (GRA)

N86-13034# Wisconsin Univ., Madison. Mathematics Research Center.
PENALIZED LIKELIHOOD FOR GENERAL SEMI-PARAMETRIC REGRESSION MODELS Technical Summary Report
P. J. Green May 1985 31 p
(Contract DAAG29-80-C-0041)

(AD-A158133; MRC-TSR-2819) Avail: NTIS HC A03/MF A01 CSCL 12/1

This paper examines maximum penalized likelihood estimation in the context of general regression problems, characterized as probability models with composite; likelihood functions. The emphasis is on the common situation where a parametric model is considered satisfactory but for inhomogeneity with respect to a few extra variables. A finite-dimensional formulation is adopted, using a suitable set of basis functions. Appropriate definitions of deviance, degrees of freedom, and residual are provided, and the method of cross-validation for choice of the tuning constant is discussed. Quadratic approximations are derived for all the required statistics. Author (GRA)

N86-13035# Wisconsin Univ., Madison. Mathematics Research Center.

HAMILTON-JACOBI EQUATIONS IN INFINITE DIMENSIONS. PART 2: EXISTENCE OF VISCOSITY SOLUTIONS Technical Summary Report

M. G. Crandall and P. L. Lions Jun. 1985 46 p

(Contract DAAG29-80-C-0041)

(AD-A158137; MRC-TSR-2826) Avail: NTIS HC A03/MF A01 CSCL 12/1

This paper is the second in a series by the authors concerned with the theory of viscosity solutions Hamilton-Jacobi equations in infinite dimensional spaces. The first paper introduced a notion of viscosity solution appropriate for the study of Hamilton-Jacobi equations in spaces with the so-called Radon-Nikodym property and obtained uniqueness theorems under assumptions paralleling the finite dimensional theory. The main results of the current paper concern existence of solutions of stationary and time-dependent Hamilton-Jacobi equations. In order to establish these results it is necessary to overcome the difficulties associated with the fact that bounded sets are not precompact in infinite dimensions and this is done by sharp constructive estimates coupled with the use of differential games to solve regularized problems. Interest in this subject arises on the abstract side from the desire to contribute to the theory of linear partial differential equations in infinite dimensional spaces to treat natural questions raised by the finite dimensional theory. Interest also arises from potential applications to the theory of control of partial differential equations. However, the results herein do not apply directly to problems of the form arising in the control of partial differential equations, a question which will be treated in the next paper of the series. Author (GRA)

N86-13036# Wisconsin Univ., Madison. Mathematics Research Center.

C INFINITY-REGULARITY FOR THE POROUS MEDIAN EQUATION Technical Summary Report

K. Hoellig and H. O. Kreiss Jun. 1985 14 p

(Contract DAAG29-80-C-0041; Grant NSF DMS-83-51187)

(AD-A158147; MRC-TSR-2828) Avail: NTIS HC A02/MF A01 CSCL 20/4

The equation stated in the abstract describes the expansion of a gas in a one dimensional porous medium. While existence of weak solutions can be obtained by standard energy methods, not much was known about regularity of the solution near the free boundaries. The difficulty is that the equation degenerates at the boundary and the hyperbolic term becomes dominant. The authors show in this report that despite of the degeneracy the free boundary is smooth with the possible exception of a discontinuity in the derivative at the waiting time. Their method is based on energy estimates in weighted norms using some of the ideas in another document. GRA

N86-13037# Wisconsin Univ., Madison. Mathematics Research Center.

A FLOQUET DECOMPOSITION FOR VOLTERRA EQUATIONS WITH PERIODIC KERNEL AND A TRANSFORM APPROACH TO LINEAR RECURSION EQUATIONS Technical Summary Report

D. L. Russell Jun. 1985 38 p

(Contract DAAG29-80-C-0041; Grant AF-AFOSR-0088-84)

(AD-A158148; MRC-TSR-2824) Avail: NTIS HC A03/MF A01 CSCL 12/1

This report provides the theoretical background for an earlier report (Frequency/Period Estimation and Adaptive Rejection of Sinusoidal Disturbances). It also lays the foundation for a new type of transform analysis for linear recursion equations which appears to be quite useful in analyzing their spectral properties. Author (GRA)

N86-13038# Wisconsin Univ., Madison. Mathematics Research Center.

THE UNIQUENESS OF HILL'S SPHERICAL VORTEX Technical Summary Report

C. J. Amick and L. E. Fraenkel May 1985 50 p

(Contract DAAG29-80-C-0041)

(AD-A158149; MRC-TSR-2820) Avail: NTIS HC A03/MF A01 CSCL 12/1

The only explicit exact solution of the problem of steady vortex rings is that found, for a particular case, by Hill in 1984; it solves a semilinear elliptic equation, of order two, involving a Stokes stream function psi (r,z) and a non-linearity sub H (psi) that has a simple discontinuity at psi = 0. This paper proves that: (1) any weak solution of the corresponding boundary-value problem is Hill's solution, modulo translation along the axis of symmetry (r = 0), and (2) any solution of the isoperimetric variational problem in another paper is a weak solution, indeed, any local maximizer is a weak solution. The result (2) is not immediate because f sub H is discontinuous; consequently, the functional that is maximized is not Frechet differentiable on the whole Hilbert space in question. Author (GRA)

N86-13039# Wisconsin Univ., Madison. Mathematics Research Center.

GLOBAL OPTIMIZATION USING AUTOMATIC DIFFERENTIATION AND INTERVAL ITERATION Technical Summary Report

L. B. Rall Jun. 1985 34 p

(Contract DAAG29-80-C-0041)

(AD-A158150; MRC-TSR-2832) Avail: NTIS HC A03/MF A01 CSCL 12/1

A standard problem in scientific computation is the optimization of a smooth (at least twice differentiable) function, possibly subject to smooth constraints. Here, optimization means finding the maximum or minimum value of the function in some region, or perhaps its stationary points. The algorithm presented in this paper solves this problem for regions which are rectangular in form. The method used is a version of interval iteration which finds one or all of the critical points of the function in the given region (the point or points at which its gradient vector vanishes), or just the critical points at which the function has its maximum or minimum values. The required values of the gradient vector and Hessian matrix of the function are obtained by automatic differentiation, which does not involve symbolic differentiation or numerical approximation of the derivatives of the function being investigated. Unlike algorithms which sample function values only at a discrete set of points, the ones given here use interval computation to furnish guaranteed bounds for all quantities of interest over the required subregions of the initial region. The results given by these optimization algorithms are thus self-validating. The algorithms presented here have been programmed using standard implementations of automatic differentiation and interval computation. Numerical examples are given to illustrate the effectiveness of this approach to the type of optimization problem considered. GRA

N86-13040# Army Cold Regions Research and Engineering Lab., Hanover, N. H.

STEFAN'S PROBLEM IN A FINITE DOMAIN WITH CONSTANT BOUNDARY AND INITIAL CONDITIONS ANALYSIS

S. Takagi Jun. 1985 36 p

(AD-A158558; CRREL-SR-85-8) Avail: NTIS HC A03/MF A01 CSCL 12/1

Stefan's problem in a finite domain is solved under constant boundary and initial conditions. Starting in a semi-infinite domain, the solution passes infinitely many stages of lead times in a finite domain and finally becomes stationary. The singularity at the finite terminal necessitates introduction of lead times. Including lead times, parameters defining the solution vary with time. Only the analytical result is reported in this paper. Partial contents: Mathematical preliminaries- Elemental functions, Integral formulas, Functions of a series; and Stefan's problem in a finite domain- Problem, Widder's solution of heat conduction, Temperature with embedding unknowns, Lead times, The Nth stage, and The final stage. GRA

N86-13041# Sandia National Labs., Albuquerque, N. Mex.
CONTROL OF STEP SIZE AND ORDER IN EXTRAPOLATION CODES
L. F. Shampine 1985 29 p refs Presented at the South African Symp. on Numerical Math, Durban, South Africa, 8 Jul. 1985
(Contract DE-AC04-76DP-00789)
(DE85-010122; SAND-85-0725C; CONF-850752-1) Avail: NTIS HC A03/MF A01

Extrapolation of the semi-implicit midpoint rule is an effective way to solve stiff initial value problems for a system of ordinary differential equations. The theory of the control of step size and order is advanced by investigating questions not taken up before, providing additional justification for some algorithms, and providing support for procedures not properly justified by the information theory approach of Deuflhard. An experimental code SIMP implementing the algorithms proposed is shown to be as good as, and in some respects much better than, the research code METAN1 of Bader and Deuflhard. DOE

N86-13042# New York Univ., New York. Mathematics and Computing Lab.
HYPERBOLIC SYSTEMS OF CONSERVATION LAWS IN SEVERAL SPACE VARIABLES
P. D. Lax May 1985 18 p
(Contract DE-AC02-76ER-03077)
(DE85-014019; DOE/ER-03077/246) Avail: NTIS HC A02/MF A01

We show how to associate to each analytic function f of one variable a complex conservation law. When written in terms of real variables, this equation turns into a symmetric hyperbolic system of two first order conservation laws in time and two space variables for two unknowns. The hope is that the theory of analytic functions can be explicited to study the properties of the solutions of these model equations. These systems are strictly hyperbolic where f' is unequal to zero, and nonlinear where f'' is unequal to zero. There is, however, in every state at least one direction of propagation which is not genuinely nonlinear. We then show that every 2 x 2 quasilinear first order hyperbolic system fails to be genuinely nonlinear in some direction of propagation. The notions of the first section are easily extended to analytic functions of several variables. DOE

N86-13043# Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho.
TRANSISTORIZED MULTIGRID METHODS. 1: LINEAR ELLIPTIC PROBLEMS ON TWO- AND THREE-DIMENSIONAL REGIONS
A. Shieh Mar. 1985 46 p Presented at the 2nd Copper Mountain Conf. on Multigrid Methods, Copper Mountain, Colo., 1 Apr. 1985
(Contract DE-AC07-76ID-01570)
(DE85-014632; EGG-M-07685; CONF-8504100-2) Avail: NTIS HC A03/MF A01

Suitable combination of mathematical transistors and half-weighting filters gives accurate estimate of local truncation error for moderate size problems with reasonable smooth solutions without up and down cycling. The use of symmetric mathematical transistors is particularly effective for supercomputing. DOE

N86-13044# Oak Ridge Y-12 Plant, Tenn.
PADE AND RECIPROCAL APPROXIMANTS AND LINEAR NOLOR FUNCTIONS
R. W. Johnson and P. I. Tinnel 28 Jun. 1985 21 p refs
(Contract DE-AC05-84OS-21400)
(DE85-015057; Y-2350) Avail: NTIS HC A02/MF A01

Converting a truncated infinite series to a rational fraction such as the Pade' Approximant (PA) can improve the accuracy of numerical calculations. The numerical integration of differential equations is an example. We have discovered a simpler method of reducing truncation errors and we call the new approximation the Reciprocal Approximant (RA). Although the RA is the easier to compute; nevertheless, for certain truncated infinite series the RA is more accurate than the PA. The NOLOR is the normal at any point of the curve of the natural logarithm of y'(dy/dx or rate) vs x (or time). It is like an instantaneous time constant which is not necessarily constant. The Nth order chemical reaction is an example of a linear NOLOR function; the derivative of NOLOR is a constant. Complex functions can often be adequately approximated with two or more segments of different linear NOLOR functions. For slab diffusion, the time derivative of NOLOR is approximately 2 before the process is 50% complete and approximately 0 after the process if 50% complete. The N value (for a chemical reaction) is the reciprocal of 1 minus the derivative of NOLOR with respect to x (or time). The inverse function of a linear NOLOR function is also a linear NOLOR function. The first derivatives are reciprocals. The inverse NOLOR is the negative of the product of NOLOR multiplied by the first derivative. The sum of the derivative of NOLOR with respect to x plus the derivative of the inverse NOLOR with respect to y is equal to 1. DOE

N86-13045# New York Univ., New York. Mathematics and Computing Lab.
ELEMENTARY WAVES AND RIEMANN SOLUTIONS: THEIR THEORY AND THEIR ROLE IN SCIENCE
J. Glimm May 1985 11 p
(Contract DE-AC02-76ER-03077)
(DE85-014018; DOE/ER-03077/249) Avail: NTIS HC A02/MF A01

Elementary waves and Riemann solutions are solutions of a nonlinear conservation law which are distinguished by symmetry properties. In this paper we discuss the theory of elementary waves and Riemann solutions with an emphasis on general concepts and open problems. The importance of these solutions to science will also be discussed. DOE

N86-12436# Joint Publications Research Service, Arlington, Va.
MATHEMATICAL PRINCIPLE FOR GENERATING SECOND-ORDER ASPHERICAL SURFACE
Pan Junhua and Wang Jinaguo *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-034) 1 Oct. 1985 p 78-84 ref Transl. into ENGLISH from Guangxue Xuebao (Shanghai), v. 4, no. 3, Mar. 1983 p 252-256 (For primary document see N86-12430 03-31)
Avail: NTIS HC A08/MF A01

N86-12463# Joint Publications Research Service, Arlington, Va.
VECTOR VALUED LONG JAMES TYPE BANACH SPACES J(eTA, l sub p)(1 < OR = p < + INFINITY)
Zhao Junfeng *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-032) 19 Sep. 1985 p 30-39 refs Transl. into ENGLISH from Xitong yu Shuxue (Beijin), v. 5, no. 1, Jan. 1985 p 51-62 (For primary document see N86-12462 03-31)
Avail: NTIS HC A08/MF A01

N86-12464# Joint Publications Research Service, Arlington, Va.
FINITE DIFFERENCE SCHEME FOR ONE-DIMENSIONAL MAGNETOHYDRODYNAMIC EQUATIONS
Liu Deming *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-032) 19 Sep. 1985 p 40-54 refs Transl. into ENGLISH from Shuzhi Jisuan yu Jisuanji Yingyong (Beijing), v. 5, no. 3, Sep. 1984 p 138-150 (For primary document see N86-12462 03-31)
Avail: NTIS HC A08/MF A01

65 STATISTICS AND PROBABILITY

Includes data sampling and smoothing; Monte Carlo method; and stochastic processes.

N86-13046# Southern Methodist Univ., Dallas, Tex.
NEW REPRESENTATIONS OF THE NON-CENTRAL chi-SQUARE DENSITY AND CUMULATIVE Technical Report, 1 Jan. 1984 - Jun. 1985
Y. M. Chou, K. H. Arthur, R. B. Rosentein, and D. B. Owen 1984 11 p
(Contract N00014-84-K-0146)
(AD-A157227; Rept-5-184-85) Avail: NTIS HC A02/MF A01 CSCL 12/1

In this reprint Representations of noncentral chi-square cumulative distribution function and probability density function are reveiwed and new representations are given. One representation of the cdf in terms of an integral is easily computed on any machine which has an accurate algorithm for computing the normal cdf. GRA

N86-13047# Maryland Univ., College Park. Dept. of Management Sciences and Statistics.
A SURVEY OF SOME RECENT RESULTS IN CONTINUOUS UNIVARIATE DISTRIBUTIONS Technical Report, Sep. 1984 - Aug. 1985
S. Kotz and N. L. Johnson Jul. 1985 17 p
(Contract N00014-84-K-0301)
(AD-A157450; UMD-DMSS-85/7) Avail: NTIS HC A02/MF A01 CSCL 12/1

Pursuant to the authors on advances in discrete distributions (Johnson and Kotz (1982)) they have commenced work on advances in continuous univariate distributions from 1971 onwards. In contrast to the situation for discrete distributions, this field was markedly more fully developed by 1970, in regard to both variety of available distributions and sophistication of methods for fitting. Possibly as a consequence, there is now available a number of very useful survey articles for particular families of distributions. This document makes reference to these at appropriate points, indicating the nature of their contents. The interested reader is recommended to study these sources for more precise information. While taking advantage of the existence of these valuable summaries to reduce the volume of our own work, the authors believed they should include enough descriptive material to provide an adequate picture of the current situation. In this discussion of distributions already in use before 1971, this document focuses mostly on methods of fitting (including the closely related topic of estimation of parameters), though there will often be examples of new applications and occasionally some new properties to report. In regard to distributions which have come into use since 1971 we will, in addition, endeavor to provide some indication of the genesis of the distribution, its properties and relations to other distributions. GRA

N86-13048# Stanford Univ., Calif. Dept. of Statistics.
TRANSFORMING CENSORED SAMPLES AND TESTING FIT
F. J. OReilly and M. A. Stephens 23 Jul. 1985 29 p
(Contract N00014-76-C-0475)
(AD-A157957; TR-361) Avail: NTIS HC A03/MF A01 CSCL 12/1

One approach to testing the goodness-of-fit of a completely specified continuous distribution with a censored sample, is to transform the corresponding uniform censored sample into a complete uniform sample and then to use any of the classical uniformity tests. Two systematic procedures for transforming a censored uniform sample are proposed. A Monte Carlo power study was conducted to analyze the relative merits of these procedures when followed by the Anderson-Darling A2 test for uniformity. The suggested transformations are versatile and with A2, give good power for most alternatives. Author (GRA)

N86-13049# Georgia Inst. of Tech., Atlanta. School of Industrial and Systems Engineering.
COMPOUND POISSON APPROXIMATIONS FOR SUMS OF RANDOM VARIABLES
R. F. Serfozo May 1985 17 p
(Grant AF-AFOSR-0367-84)
(AD-A158555; AFOSR-85-0623TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

This document shows that a sum of dependent random variables is approximately compound Poisson when the variables are rarely nonzero and, given they are nonzero, their conditional distributions are nearly identical. It gives several upper bounds on the total-variation distance between the distribution of such a sum and a compund Poisson distribution. Included is an example for Markovian occurrences of a rare event. The bounds are consistent with those that are known for Poisson approximations for sums of uniformly small random variables. Author (GRA)

N86-13050# Los Alamos National Lab., N. Mex.
SYSTEMS ANALYSIS APPROACH TO PROBABILISTIC MODELING OF FAULT TREES
R. J. Bartholomew and C. R. Qualls 1985 12 p Presented at the 8th Intern. Conf. On Struct. Mech. In Reactor Technol., Brussels, 19 Aug. 1985 Prepared in cooperation with New Mexico Univ., Albuquerque
(Contract W-7405-eng-36)
(DE85-007705; LA-UR-85-494; CONF-850809-15) Avail: NTIS HC A02/MF A01

A method of probabilistic modeling of fault tree logic combined with stochastic process theory (Markov modeling) has been developed. Systems are then quantitatively analyzed probabilistically in terms of their failure mechanisms including common cause/common mode effects and time dependent failure and/or repair rate effects that include synergistic and propagational mechanisms. The modeling procedure results in a state vector set of first order, linear, inhomogeneous, differential equations describing the time dependent probabilities of failure described by the fault tree. The soiutions of this Failure Mode State Variable (FMSV) model are cumulative probability distribution functions of the system. A method of appropriate synthesis of subsystems to form larger systems is developed and applied to practical nuclear power safety systems. DOE

66 SYSTEMS ANALYSIS

Includes mathematical modeling; network analysis; and operations research.

N86-13051# Federal Aviation Administration, Washington, D.C. Office of Aviation Policy and Plans.
STATISTICAL SAMPLING OF AIRCRAFT OPERATIONS AT NON-TOWERED AIRPORTS
M. Ford and R. Shirack Apr. 1985 49 p
(AD-A157095; FAA-APO-85-7) Avail: NTIS HC A03/MF A01 CSCL 12/1

The purpose of this handbook is to provide a statistically sound method of estimating aircraft operations at non-towered airports from sampling counts. The handbook is written for planners, engineers, airport operators responsible for aircraft planning, and persons that collect data for FAA Airport Master Records (Form 5010.1). Many of these users will be familiar with general aviation airports, but not necessarily with statistical methods. Accurate information on aircraft activity at non-towered airports is a major need of airport owners and operators as well as planners and administrators charged with the planning and development of the airport system. Unlike towered airports, where air traffic controllers keep constant tallies of activity, most non-towered airports have no accurate record of usage. Obtaining accurate aircraft activity counts will provide a variety of benefits. Investment decisions can be made with more confidence if benefit-cost analysis is based on accurate information about use of the facility. Design criteria, which may have a significant impact on development and operating costs, can be more efficiently applied. Even when decisions

are based on forecasts rather than present circumstances, accurate base data is necessary to make accurate forecasts of activity.
GRA

N86-13052# Stanford Univ., Calif. Dept. of Computer Science.
DEALS AMONG RATIONAL AGENTS
J. S. Rosenschein and M. R. Genesereth Mar. 1985 28 p
(Contract N00039-83-C-0136)
(AD-A157960; AD-E401371; SU-STAN-CS-85-1042; HPP-84-44) Avail: NTIS HC A03/MF A01 CSCL 12/1

A formal framework is presented that models communication and promises in multi-agent interactions. This framework generalizes previous work on cooperation without communication, and shows the ability of communication to resolve conflicts among agents having disparate goals. Using a deal-making mechanism, agents are able to coordinate and cooperate more easily than in the communication-free model. In addition, there are certain types of interactions where communication makes possible mutually beneficial activity that is otherwise impossible to coordinate.
Author (GRA)

67 THEORETICAL MATHEMATICS

Includes topology and number theory.

No abstracts in this category.

70 PHYSICS (GENERAL)

For geophysics see *46 Geophysics*. For astrophysics see *90 Astrophysics*. For solar physics see *92 Solar physics*.

N86-13053# Brookhaven National Lab., Upton, N. Y.
USE OF AN ELLIPTICAL APERTURE TO CONTROL SATURATION IN CLOSELY-COUPLED, COLD IRON, SUPERCONDUCTING DIPOLE MAGNETS
G. Morgan 1985 11 p refs Presented at the Particle Acclerator Conf., Vancouver, British Columbia, 13 May 1985
(Contract DE-AC02-76CH-00016)
(DE85-012259; BNL-36623; CONF-850504-167) Avail: NTIS HC A02/MF A01

The high fields permitted by superconducting windings result in saturation of closely-coupled iron in dipole and quadrupole beam transport magnets. Coupland suggested using a triangular cutout at the poles to reduce the change in the sextuple (b2) term due to saturation. The use of an elliptical aperture in a close-coupled dipole for the Relativistic Heavy Ion Collider (RHIC) has been studied using the BNI computer program MDP (a version of GFUN). The ellipse aspect ratio was varied while holding the horizontal (minor) radius constant. The proper aspect ratio gives no shift in b2 due to saturation, and a reduction in the b4 shift. A modification of the ellipse also reduces b4. The elliptical aperture introduces a large b2 term at low field which must be compensated for by the coil design. A practical coil design which does this for the RHIC magnet is presented.
DOE

N86-13054# California Univ., Berkeley. Lawrence Berkeley Lab.
DESIGN AND PERFORMANCE OF 40 mm, 6.5 T, COLLARED, COLD-IRON MODEL MAGNETS
C. Peters, W. Gilbert, W. Hassenzahl, K. Mirk, J. Rechen, R. Scanlan, and C. Taylor May 1985 6 p Presented at the Particle Accelerator Conf., Vancouver, British Columbia, 13 May 1985
(Contract DE-AC03-76SF-00098)
(DE85-015277; LBL-19579; CONF-850504-224) Avail: NTIS HC A02/MF A01

Model magnets have been built and tested at the Lawrence Berkeley Laboratory to verify a candidate design for the main bending magnets of the SSC. Construction of thesis series of dipole models was begun in October 1984 and will be completed in October 1985. To date, Three models with collars, C1, C2, and C3, have been completed. Models C1 and C2 have been tested.
Author

N86-13055# Brookhaven National Lab., Upton, N. Y.
REPLICA-SPACE RENORMALIZATION IN RANDOM-FIELD SYSTEMS
Y. Shapir 1985 10 p refs Presented at the Intern. Conf. on Magnetism, San Francisco, 26 Aug. 1985
(Contract DE-AC02-76CH-00016)
(DE85-014800; BNL-36708; CONF-850890-3) Avail: NTIS HC A02/MF A01

The critical behavior of random field systems is characterized by exponentially long relaxation times. They may differ by orders of magnitude and slow modes have to be considered quenched with respect to the faster ones. This requires a drastic modification of the renormalization process in which the degrees of freedom are integrated out. A new replica space renormalization procedure, to carry out the coarse graining of the time intervals, is presented. We relate by recursion relations the effective reduced dimensions of consecutive time scales. Their stable fixed points yield the apparent dimensionalities for the longest and shortest time scales, which are insensitive to the exact behavior on intermediate scales. For Ising systems we find that $d = 2$ is the lower critical dimension in both regimes. The thermal exponents for $d = 3$, in the short time observable regime, are related to those of the pure system in $d = 2$. This is consistent with the observations in field cooled random antiferromagnets of the correlation length exponent nu approx. = 1 (by neutron scattering) and of the symmetric logarithmic divergence in the specific heat (by linear birefrigence).
DOE

71 ACOUSTICS

Includes sound generation, transmission and attenuation. For noise pollution see *45 Environment Pollution*.

N86-13056*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
A METHOD FOR DETERMINING ACOUSTIC-LINER ADMITTANCE IN DUCTS WITH SHEARED FLOW IN TWO-CROSS-SECTIONAL DIRECTIONS
Willie R. Watson Oct. 1985 40 p refs
(NASA-TP-2518; L-15997; NAS 1.60:2518) Avail: NTIS HC A03/MF A01 CSCL 20A

A method is developed for determining the acoustic admittance of a test liner installed in the wall of a grazing flow impedance tube. The mean flow is permitted flow gradients in both cross-sectional directions of the tube. The unknown admittance value is obtained by solving an eigenvalue problem. This eigenvalue problem results from the application of the finite-element method to the partial differential equation and boundary conditions governing the acoustic field. The credibility of the method is established by comparing results with exact solutions obtained for a constant mean-flow profile and with previous results for cases involving shear in only one cross-sectional direction. Excellent comparisons are obtained in both cases. The analysis is used in conjunction with a limited amount of experimental data and shows that the flow must be accurately modeled in order to determine the acoustic-liner properties.
Author

N86-13057*# Purdue Univ., West Lafayette, Ind. School of Mechanical Engineering.
PREDICTION OF SOUND FIELDS IN ACOUSTICAL CAVITIES USING THE BOUNDARY ELEMENT METHOD M.S. Thesis
Carl R. Kipp and R. J. Bernhard Aug. 1985 163 p refs
(Grant NAG1-58)
(NASA-CR-176295; NAS 1.26:176295; HL-85-26) Avail: NTIS HC A08/MF A01 CSCL 20A

A method was developed to predict sound fields in acoustical

cavities. The method is based on the indirect boundary element method. An isoparametric quadratic boundary element is incorporated. Pressure, velocity and/or impedance boundary conditions may be applied to a cavity by using this method. The capability to include acoustic point sources within the cavity is implemented. The method is applied to the prediction of sound fields in spherical and rectangular cavities. All three boundary condition types are verified. Cases with a point source within the cavity domain are also studied. Numerically determined cavity pressure distributions and responses are presented. The numerical results correlate well with available analytical results. E.A.K.

N86-13058# Max-Planck-Institut fuer Stroemungsforschung, Goettingen (West Germany).
TRANSONIC NOISE GENERATION BY DUCT AND PROFILE FLOW Annual Technical Report
G. E. A. Meier Oct. 1984 106 p
(Contract DAJA37-81-C-0251; DA Proj. 1T1-61102-BH-57)
(AD-A157163; ATR-3) Avail: NTIS HC A06/MF A01 CSCL 20/1

Acoustic distortions which are generated by a downstream instability of shear layers are travelling upstream in the subsonic part of the laval flow and are acting on the shock wave at the end of the supersonic part. This interaction causes strong oscillations. Different kinds of separation and secondary vortex generation have a governing influence on profile-vortex interaction flow. GRA

N86-13059# Mississippi Univ., University. Physical Acoustics Research Lab.
BIOLOGICAL EFFECTS OF ACOUSTIC CAVITATION
L. A. Crum 15 Jun. 1985 100 p
(Contract N00014-84-C-0193)
(AD-A157513; TR-3-85) Avail: NTIS HC A05/MF A01 CSCL 06/16

This report contains the lecture notes of the author for a short course entitled Biological Effects of Acoustic Cavitation presented at the University of Rochester, May 13 to 16, 1985. Lecture 2 notes pertain to: Nucleation, rectified diffusion, stable cavitation and experimental measurements. Contents of lecture 2 notes include: stabilization and nucleation of cavitation nuclei; rectified diffusion; stable cavitation; experimental measurements of cavitation produced by short acoustic pulses. GRA

N86-13060# Admiralty Marine Technology Establishment, Teddington (England).
SOUND SCATTERING BY A LAYERED SPHERE
S. J. Ansley and E. A. Skelton May 1985 27 p
(AD-A157915; AMTE(N)/TM85057; DRIC-BR-96422) Avail: NTIS HC A03/MF A01 CSCL 20/1

The sphere, which is located in an acoustic fluid, is composed of an arbitrary number of concentric layers of elastic solids and fluids. It is excited by a time-harmonic incident plane wave. The exact linear equations of elasto-dynamics, visco-dynamics and acoustics are solved to obtain, via the finite element method, a matrix equation which connects the interface displacements and external stresses in the spectral domain. The pressure scattered to the far-field is obtained from the radial spectral displacements of the outer surface. Numerical results of scattered sound spectra are presented for the case of an aluminium shell with and without a GRP (Glass Reinforced Plastics) coating. GRA

N86-13061# Pennsylvania State Univ., University Park.
DEVELOPMENT OF ACOUSTIC AGGLOMERATOR. TEST PLAN FOR HIGH TEMPERATURE HIGH PRESSURE ACOUSTIC AGGLOMERATOR
12 Aug. 1985 16 p Prepared in cooperation with Aerojet Energy Conversion Co., Sacramento, Calif.
(Contract DE-AC21-84MC-20107)
(DE85-017221; DOE/MC-20107/T3) Avail: NTIS HC A02/MF A01

The design specifications for the HTHP AA Facility are listed. The facility is an open-loop, air flow system with subsystems and components to provide the high temperature, high pressure, residence time, dust loading and acoustic irradiation to simulate the aerosol and Hot Gas Cleanup (HGCU) AA system of a Pressurized Fluid Bed Combustor (PFBC), Combined Cycle Power Plant. Data sampling, instrumentation, and automatic controls and data analysis systems are also provided. This test plan describes the testing to be done on the high temperature, high pressure acoustic agglomerator (HTHP AA) at Pen State University's High Intensity Acoustic Laboratory. DOE

N86-13062# Los Alamos Scientific Lab., N. Mex.
SOUND VELOCITIES IN LIQUID LEAD AT HIGH TEMPERATURES
R. S. Hixson, M. A. Winkler, and J. W. Shaner 1985 10 p Presented at the 9th Symp. on Thermophys. Properties, Boulder, Colo., 24 Jun. 1985
(Contract W-7405-eng-36)
(DE85-014091; LA-UR-85-2190; CONF-850617-2) Avail: NTIS HC A02/MF A01

A dynamic technique, the isobaric expansion experiment (IEX) is used to reach high temperature and pressure states in liquid lead. A unique technique is described for making sound speed measurements once a final equilibrium end state is obtained. Data over an extended density range are presented. The sound speed in liquid lead over this range appears to vary linearly with density, and has no dependence on temperature within our experimental precision. DOE

N86-13063# New Jersey State Dept. of Transportation, Trenton. Div. of Research and Demonstration.
EVALUATION OF HONEYCOMB HIGHWAY SOUND BARRIER I-280 SECTION 8B, HARRISON, NEW JERSEY Final Report, Feb. 1981 - Jul. 1983
M. Marsella Oct. 1984 51 p
(PB85-231157; Rept-85-004-7799-10; FHWA/NJ-85/004) Avail: NTIS HC A04/MF A01 CSCL 13B

The insertion loss of a traffic noise barrier erected along I-280 in Harrison, N.J. was determined. This barrier was constructed of a phenolic-impregnated paper honeycomb core faced with aluminum panels on both sides a type not previously used in New Jersey. Noise data was recorded both before and after barrier construction, from several microphones placed at two locations at a site adjacent to the highway. Also recorded were traffic counts by type of vehicle for both eastbound and westbound traffic and traffic speeds for westbound traffic only. For comparison purposes, small samples were randomly selected from the full size samples and analyzed using the same method. GRA

N86-12386# Tohoku Univ., Sendai (Japan). Research Inst. of Electrical Communication.
ACCURACY OF A NEW ULTRASONIC APPARATUS FOR SIMPLE MEASUREMENT OF VISCOELASTICITY
Ryohji Aoyagi and Hiroshi Shimizu *In its* The Record of Elec. and Commun. Eng. Conversazione, Vol. 54, No. 1 Aug. 1985 p 14-19 refs In JAPANESE; ENGLISH summary (For primary document see N86-12383 03-31)
Avail: NTIS HC A03/MF A01

N86-12403# Joint Publications Research Service, Arlington, Va.
STATUS, DEVELOPMENT OF POWER ULTRASONICS IN CHINA
Zhang Fucheng and Cheng Cundi *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-035) 17 Oct. 1985 p 40-51 refs Transl. into ENGLISH from Yingyong Shengxue (Beijing), v. 4, no. 3, Jul. 1985 p 1-6 (For primary document see N86-12399 03-31)
Avail: NTIS HC A08/MF A01

N86-12643# Joint Publications Research Service, Arlington, Va.
ANGULAR DISTRIBUTION OF INTENSITY OF SOUND RERADIATED BY OCEAN SURFACE AT SMALL GLANCING ANGLES Abstract Only
Ye. A. Kopyl *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 14 Transl. into ENGLISH from Izv. Akad. Nauk

SSSR: Fiz. Atm. i Okeana (Moscow), v. 21, no. 1, Jan. 1985 p 98-101 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

N86-12649# Joint Publications Research Service, Arlington, Va.
NUMERICAL ESTIMATE OF EFFECTIVENESS OF APPROXIMATE EQUATIONS FOR ACOUSTIC FIELD NEAR SURFACE OF DEEP SEA
M. V. Perel *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 18 Transl. into ENGLISH from Akust. Zh. (Moscow), v. 30, no. 6, Nov. - Dec. 1984 p 813-818 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

N86-12656# Joint Publications Research Service, Arlington, Va.
ACOUSTICAL FIELD OF DIRECTIONAL SOURCE IN OCEANIC WAVEGUIDES Abstract Only
G. I. Bykovtsev, G. N. Kuznetsov, and A. N. Stepanov *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 25 Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 280, no. 1, Jan. 1985 p 57-59 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

N86-12664# Joint Publications Research Service, Arlington, Va.
STRUCTURE OF ACOUSTIC FIELD IN DEEP SEA AT SHALLOW DEPTHS AND AT GREAT RANGES Abstract Only
V. S. Buslayev and M. V. Perel *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 32-33 Transl. into ENGLISH from Vestn. Leningr. Univ.: Fiz. Khim. (Leningrad), no. 22, Nov. 1984 p 9-17 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

N86-12706# Joint Publications Research Service, Arlington, Va.
ACOUSTIC METHODS FOR FEATURING HIGH-FREQUENCY PART OF SPECTRUM OF SEA WAVES Abstract Only
G. Yu. Narodnitskiy *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-008) 16 Aug. 1985 p 11 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atm. i Okeana (Moscow), v. 21, no. 4, Apr. 1985 p 443-446 (For primary document see N86-12697 03-42)
Avail: NTIS HC A04/MF A01

72 ATOMIC AND MOLECULAR PHYSICS

Includes atomic structure and molecular spectra.

N86-13064*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
REVIEW OF SPECTROSCOPIC PARAMETERS FOR UPPER ATMOSPHERIC MEASUREMENTS
Mary Ann H. Smith, ed. Oct. 1985 28 p refs Presented at the Spectroscopic Parameters Workshop, Hampton, Va., 17-18 Oct. 1984
(NASA-CP-2396; L-16022; NAS 1.55:2396) Avail: NTIS HC A03/MF A01 CSCL 04A

The workshop included communication of spectroscopic data requirements for the planned upper atmosphere research satellite (UARS) mission, review of the status of currently available spectroscopic parameters, and recommendation of additional studies. The objectives were accomplished and resulted in a series of general and specific recommendations for laboratory spectroscopy research to meet the needs of UARS and other atmospheric remote sensing programs. E.A.K.

N86-13065# Aerospace Corp., El Segundo, Calif. Chemistry and Physics Lab.
MICROWAVE FIELD STRENGTH MEASUREMENT IN A RUBIDIUM CLOCK CAVITY VIA ADIABATIC RAPID PASSAGE
R. P. Frueholz and J. C. Camparo 24 Jun. 1985 23 p
(Contract F04701-83-C-0084)
(AD-A157070; TR-0084A(5945-05)-3; SD-TR-85-16) Avail: NTIS HC A02/MF A01 CSCL 14/2

Rubidium (Rb) atomic frequency standards have been found to display a strong frequency dependence on the microwave power density or field intensity. It is therefore desirable to have simple and easily applied techniques for measuring not only the field strength but also the field distribution within the clock's microwave cavity. A technique that makes use of adiabatic rapid passage (ARP) to measure field strengths in Rb clock cavities is described and demonstrated. Measurements using this technique are found to agree with field strengths extracted by means of standard microwave procedures. The ARP technique is particularly valuable in cavities where standard microwave measurements can not be made. GRA

N86-13066# Aerospace Corp., El Segundo, Calif. Chemistry and Physics Lab.
A DRESSED ATOM INTERPRETATION OF ADIABATIC RAPID PASSAGE
J. C. Camparo and R. P. Frueholz 24 Jun. 1985 25 p
(Contract F04701-83-C-0084)
(AD-A157071; TR-0084A(5945-05)-2; SD-TR-85-15) Avail: NTIS HC A02/MF A01 CSCL 20/10

Consider the problem of adiabatic rapid passage (ARP) in a dressed atom formalism. The conditions for ARP can be understood as conditions for minimizing the probability of dressed atomic-state transitions, and that these probabilities can be used to obtain an estimate of the degree of population reversal. Furthermore, by considering ARP in the dressed atom formalism, the similarity between ARP and the Landau-Zener nonadiabatic transition problem is made quite apparent. GRA

N86-13067# Aerospace Corp., El Segundo, Calif. Chemistry and Physics Lab.
THE INHOMOGENEOUS LIGHT SHIFT IN ALKALI ATOMS
J. C. Camparo, R. P. Frueholz, and C. H. Volk 24 Jun. 1985 43 p
(Contract F04701-83-C-0084)
(AD-A157498; TR-0084A(5945-05)-6; SD-TR-85-19) Avail: NTIS HC A03/MF A01 CSCL 07/4

The dynamic Stark shift of an inhomogeneously broadened spectral transition has been studied. Our measurements show a shift in the observed 87 Rb ground-state hyperfine transition, which has a nonlinear dependence on light intensity when the conditions for inhomogeneous broadening are met. The nonlinearity is the result of light-intensity gradients in the signal volume, which produce an inhomogeneously broadened asymmetric microwave transition. We show that our measurements are in full agreement with the second-order perturbation-theory treatment of light-induced energy-level shifts when the effects of inhomogeneities are properly taken into consideration. The effects of inhomogeneous broadening must be carefully considered when one extracts oscillator strengths from light-shift data, or performs high-precision laser spectroscopy. GRA

N86-13068# Department of the Navy, Washington, D. C.
GENERATION OF A MODULATED IREB (INTENSE RELATIVISTIC ELECTRON BEAM) WITH A FREQUENCY TUNABLE BY A MAGNETIC FIELD Patent Application
M. Friedman and V. Serlin, inventors (to Navy) Filed 8 Jul. 1985 24 p
(AD-D011820; US-Patent-Appl-SN-752867) Avail: NTIS HC A02/MF A01 CSCL 20/7

The present invention comprises a device for generating a modulated intense relativistic beam (IREB) with an electronically tunable frequency, comprising: a longitudinally running drift tube; a plurality of gaps in the drift tube including first gap and a second gap, disposed with a predetermined distance therebetween; and a plurality of cavities, with a first cavity disposed around the drift tube at the location of the first gap, and a second cavity disposed around the drift tube at the location of the second gap. These first and second cavities are provided with volumes and a geometry such as to excite a predetermined frequency band below the plasma frequency for the device. A circuit is provided for generating an IREB and injecting this IREB to propagate within

the drift tube with a predetermined plasma frequency. Additionally, a main magnetic field generating means is provided for generating an IREB and injecting this IREB to a desired beam diameter. The frequency tuning is obtained by providing an auxiliary magnetic field running parallel to and within the drift tube and located only along a predetermined length between the first and second gaps, with this auxiliary magnetic field running parallel to and within the drift tube and located along a predetermined length between first and second gaps, with this auxiliary magnetic field being tunable to thereby tune the frequencies of excitations in the first and second gaps. Finally, a means is provided at one end of the drift tube for converting the kinetic energy of the IREB into electrical energy. GRA

N86-13069# Oak Ridge National Lab., Tenn.
CHARGE-STATE DISTRIBUTIONS OF 100, 175, 275 AND 352 MeV GOLD IONS EMERGING FROM THIN CARBON FOILS
J. A. Martin, R. L. Auble, K. A. Erb, C. M. Jones, and D. K. Olsen 1985 17 p refs Presented at the 4th Intern. Conf. on Electrostatic Accelerator Technol. and Assoc. Boosters, Buenos Aires, 15 Apr. 1985
(Contract DE-AC05-84OR-21400)
(DE85-014651; CONF-850470-6) Avail: NTIS HC A02/MF A01

These measurements were undertaken as a consequence of our failure early this year to accelerate Au(+46) ions in the Oak Ridge Isochronous Cyclotron using an injected beam of 352 MeV (197)Au(+17) from the 25 MV tandem accelerator. Following that unsuccessful test, we made a preliminary measurement of the charge-state distribution of 352 MeV (197) Au ions emerging from a carbon foil using the bending magnet that is a part of the cyclotron beam injection system. The measured mean charge was approx. 38.5, about 4.5 charge-states lower than predicted by the Sayer semi-empirical formula. The measurements reported here were done more precisely and systematically confirm that preliminary result. DOE

N86-13070# Stanford Linear Accelerator Center, Calif.
BEAM EMITTANCE AND BEAM DISRUPTION
R. Hollebeek and A. Minten 1 Jun. 1985 5 p ref
(Contract DE-AC03-76SF-00515)
(DE85-015136; SU-SLAC-CN-301) Avail: NTIS HC A02/MF A01

Beam disruption during the collision of intense relativistic bunches has been studied by R. Hollebeek. In the case of oppositely charged bunches, focussing effects occur causing a decrease in the effective bunch cross section, and therby an increase of luminosity by an ehancement factor H. The term disruption derives from the fact that the beam emittance changes markedly during the collision. DOE

N86-13071# Stanford Linear Accelerator Center, Calif.
DISRUPTION AND LUMINOSITY OF FLAT BEAMS
R. Hollebeek and A. Minten 10 Jun. 1985 8 p refs
(Contract DE-AC03-76SF-00515)
(DE85-015137; SU-SLAC-CN-302) Avail: NTIS HC A02/MF A01

It has been suggested that high energy linear colliders might operate with non-round beam profiles, i.e., with different signa sub x and sigma sub y, described by an aspect ratio R = sigma sub x. The advantage of flat beams is the expectation, that bremsstrahlung, i.e., beam-beam synchrotron radiation is reduced with increasing R. The reason for this reduction comes from the fact that for constant bunch area and therefore constant luminosity the mean physical distance between the particles increases with R. When the physical distances are larger, the electromagnetic fields and therefore particle acceleration and radiation decrease. This would be of particular importance for very large linear colliders (VLC), where bremsstrahlung may consume an appreciable fraction of the incident energy. The underlying assumption is that the emittance quality can be preserved in the deformed bunch. DOE

N86-13072# California Univ., Berkeley. Lawrence Berkeley Lab.
SPIN-POLARIZATION OBSERVABLES IN ELASTIC ELECTRON SCATTERING FROM SPIN-1/2 NUCLEI
H. E. Conzett May 1985 4 p refs Presented at the 6th Intern. Symp. on Polarization Phenomena in Nucl. Phys., Osaka, 26 Aug. 1985
(Contract DE-AC03-76SF-00098)
(DE85-016639; LBL-19827; CONF-850807-5) Avail: NTIS HC A02/MF A01

Using the formalism nucleon-nucleon scattering as a starting point, electron scattering from spin-1/2 nuclei is examined. It is seen that high-energy electron-nucleon scattering, for example, exhibits a remarkable simplicity when compared with that of nucleon-nucleon scattering. The 6 amplitudes and 36 nucleon-nucleon observables are reduced to 3 and 9, respectively, by the relativistic nature of the electron. The one-photon exchange mechanism finally reduces the number of amplitudes and independent observables to 2. This treatment serves to extend the spin-polarization language of hadronic scattering to that of electron scattering also. DOE

N86-13073# Brookhaven National Lab., Upton, N. Y.
COLLIDER PERFORMANCE WITH IDEAL COLLISIONS
M. Month 1 Jun. 1985 12 p
(Contract DE-AC02-76CH-00016)
(DE85-017011; BNL-51909) Avail: NTIS HC A02/MF A01

Performance is estimated for head-on bunch collisions. The luminosity is written as a distribution in time and length along the collision path, using a Gaussian distribution in all space dimensions. Computations are made for the Tevatron. Sources of luminosity reduction are listed in the case of non-ideal conditions. DOE

N86-13074# California Univ., Berkeley. Lawrence Berkeley Lab.
SUPPRESSION OF PROPAGATING TE MODES IN THE FNAL ANTIPROTON SOURCE STOCHASTIC BEAM COOLING SYSTEM
W. C. Barry May 1985 5 p Presented at the Particle Accelerator Conf., Vancouver, British Columbia, 13 May 1985
(Contract DE-AC03-76SF-00098)
(DE85-016559; LBL-18797; CONF-850504-280) Avail: NTIS HC A02/MF A01

A method of attenuating the propagation of waveguide modes in the stochastic cooling array beam pipes to be utilized in the accumulator and debuncher rings of the Fermilab antiproton source is described. The attenuation method treated involves lining the vertical walls of the beam pipes with a ferromagnetic material. The general solution for propagation in a nonhomogeneously loaded waveguide is presented along with numerical results specific to the antiproton source beam cooling system. Also described is a broadband, automated technique for the simultaneous measurement of complex (MU) and epsilon developed to aid in the characterization of different ferrite materials. Permittivity and permeability data for a typical ferrite are presented along with a discussion of the effects of these parameters on waveguide mode attenuation in the ferrite lined beam pipes. DOE

N86-13075# Stanford Linear Accelerator Center, Calif.
CONTROL PROBLEMS IN VERY LARGE ACCELERATORS
M. C. Crowley-Milling Jun. 1985 14 p Presented at the Particle Accelerator Conf., Vancouver, British Columbia, 13 May 1985
(Contract DE-AC03-76SF-00515)
(DE85-014956; SU-SLAC-Pub-3624-Rev; CONF-850504-103-Rev) Avail: NTIS HC A02/MF A01

There is no fundamental difference of kind in the control requirements between a small and a large accelerator since they are built of the same types of components, which individually have similar control inputs and outputs. The main difference is one of scale; the large machine has many more components of each type, and the distances involved are much greater. Both of these factors must be taken into account in determining the optimum way of carrying out the control functions. Small machines should use standard equipment and software for control as much as possible, as special developments for small quantities cannot normally be justified if all costs are taken into account. On the other hand, the very great number of devices needed for a large machine means that, if special developments can result in

simplification, they may make possible an appreciable reduction in the control equipment costs. It is the purpose of this report to look at the special control problems of large accelerators, which the author shall arbitarily define as those with a length of circumference in excess of 10 km, and point out where special developments, or the adoption of developments from outside the accelerator control field, can be of assistance in minimizing the cost of the control system. Most of the first part of this report was presented as a paper to the 1985 Particle Accelerator Conference. It has now been extended to include a discussion on the special case of the controls for the SSC. DOE

N86-13076# California Univ., Berkeley. Lawrence Berkeley Lab.
THEORETICAL STUDIES OF MOLECULAR INTERACTIONS
W. A. Lester, Jr. May 1985 6 p refs Presented at the DOE/BES Contractors' Combustion Meeting, Lake Geneva, Wisc., 22 May 1985
(Contract DE-AC03-76SF-00098)
(DE85-012604; LBL-19583; CONF-850578-3) Avail: NTIS HC A02/MF A01

The goal of this program is to extend fundamental knowledge of combustion processes by theoretical studies of the dynamics of energy transfer, reactive, and photodissociative processes. The approach is based on the reliable description of inter and intramolecular interactions using ab initio methods and a variety of approaches to describe the dynamics of nuclear motion. A summary of recent results and future plans follows. DOE

N86-13077# Brookhaven National Lab., Upton, N. Y.
CHAOTIC DYNAMICAL APERTURE
S. Y. Lee and S. Tepikian 1985 3 p Presented at the Particle Accelerator Conf., Vancouver, British Columbia, 13 May 1985
(Contract DE-AC02-76CH-00016)
(DE85-013285; BNL-36565; CONF-850504-159) Avail: NTIS HC A02/MF A01

Nonlinear magnetic forces become more important for particles in the modern large accelerators. These nonlinear elements are introduced either intentionally to control beam dynamics or by uncontrollable random errors. Equations of motion in the nonlinear Hamiltonian are usually non-integrable. Because of the nonlinear part of the Hamiltonian, the tune diagram of accelerators is a jungle. Nonlinear magnet multipoles are important in keeping the accelerator operation point in the safe quarter of the hostile jungle of resonant tunes. Indeed, all the modern accelerator designs have taken advantages of nonlinear mechanics. On the other hand, the effect of the uncontrollable random multipoles should be evaluated carefully. A powerful method of studying the effect of these nonlinear multipoles is using a particle tracking calculations, where a group of test particles are tracing through these magnetic multipoles in the accelerator hundreds to millions of turns in order to test the dynamical aperture of the machine. These methods are extremely useful in the design of a large accelerator such as SSC, LEP, HERA and RHIC. These calculations unfortunately take a tremendous amount of computing time. In this review the method of determining chaotic orbit and applying the method to nonlinear problems in accelerator physics is discussed. We then discuss the scaling properties and effect of random sextupoles. DOE

N86-13078# Los Alamos Scientific Lab., N. Mex.
RECONSTRUCTION OF LONGITUDINAL BEAM PROFILES FROM NONDESTRUCTIVE ELECTROMAGNETIC PROBES
J. D. Gilpatrick and C. A. Watson May 1985 3 p refs Presented at the Particle Accelerator Conf., Vancouver, British Columbia, 13 May 1985
(Contract W-7405-eng-36)
(DE85-012675; LA-UR-85-1598; CONF-850504-101) Avail: NTIS HC A02/MF A01

The Fusion Materials Irradiation Test (FMIT) 2-MeV accelerator has nondestructive diagnostic probes that sense changes in the electromagnetic fields of the bunched beam. These probes accurately perform their primary functions, but do not have well-behaved, frequency-domain characteristics from which the longitudinal beam profile can be measured using convolution-integral processing techniques. Therefore, each of the probes' transfer function was determined using a tightly bunched electron beam as a source for impulse response tests. Using the Signal Processing Analyzer (SPA) code, output signals from these probes mounted on the FMIT beamline were deconvolved with sampled impulse response data to produce a longitudinal electromagnetic field distribution of a beam bunch. With SPA's signal-processing techniques, any electromagnetic probe shorter than (BETA)lambda and having significant signal-to-noise ratios can reconstruct longitudinal profiles, provided the probe's transfer function is known. DOE

N86-13079# California Univ., Berkeley. Lawrence Berkeley Lab.
STOCHASTIC BEAM COOLING AMPLIFIER SYSTEM FRONT END COMPONENTS PERFORMANCE CHARACTERISTICS
C. C. Lo May 1985 14 p Presented at Particle Accelerator Conf., Vancouver, British Columbia,
(Contract DE-AC03-76SF-00098)
(DE85-013925; LBL-18711; CONF-850504-186) Avail: NTIS HC A02/MF A01 13 May 1985

The stochastic beam cooling amplifier front end consists of 180(0) hybrids, cables, directional couplers, power dividers/combiners and low noise preamplifiers. Most front ends will be operating at near liquid nitrogen (LN) temperature. Components used in the front ends should be able to operate at this temperature satisfactorily. Since the noise performance of the front end is of utmost importance to the beam cooling process, the insertion losses of cables, 180(0) hybrids, directional couplers and power combiners have been measured at room temperature and near liquid nitrogen temperature. The purpose of this report is to describe and present some measurements and data on the components mentioned, with the exception of the 1 to 2 and 2 to 4 GHz preamplifiers, which have been described elsewhere. DOE

N86-13080# Fermi National Accelerator Lab., Batavia, Ill.
THEORIES OF STATISTICAL EQUILIBRIUM IN ELECTRON-POSITRON COLLIDING-BEAM STORAGE RINGS
J. F. Shonfeld Jan. 1985 15 p Presented at the Joint US/CERN School on Particle Accelerators Topical Course on Non-Linear Dyn., Sardinia, Italy, 31 Jan. 1985
(Contract DE-AC02-76CH-03000)
(DE85-012303; FNAL/C-85/18-T; CONF-850114-2) Avail: NTIS HC A02/MF A01

In this lecture I introduce you to some recent theoretical work that represents a significant and long overdue departure from the mainstream of ideas on the physics of colliding-beam storage rings. The goal of the work in question is to understand analytically - without recourse to computer simulation - the role that dissipation and noise play in the observed colliding-beam behavior of electron-positron storage rings. DOE

N86-13081# Los Alamos National Lab., N. Mex.
LAMPF TRANSITION-REGION MECHANICAL FABRICATION
E. D. Bush, Jr., J. D. F. Gallegos, R. Harrison, V. E. Hart, W. T. Hunter, S. E. Rislove, J. R. Sims, and W. J. VanDyke 1985 4 p Presented at the Particle Accelerator Conf., Vancouver, British Columbia, 13 May 1985
(Contract W-7405-eng-36)
(DE85-012688; LA-UR-85-1546; CONF-850504-129) Avail: NTIS HC A02/MF A01

The new Transition Region (TR-II) optimizes phase matching of H(+) and H(-) beams during simultaneous transport between the drift-tube linac and side-coupled linac at LAMPF. Improvements include, larger aperture, a straight beam track, greater beam patch length adjustments, and better utility routing. Hardware density required innovative designs for magnets, mounting, vacuum, and utilities. Dipoles are powered by one constant current and one variable current supply which cause the fields to add or buck providing + or - 20 mm path length variation for phase matching. Alignment was done using two digital theodolites coupled to a computer to give real-time three-dimensional data. Production beams up to 950 (MU)A at 100 MeV have been routinely transported since September 1983. DOE

N86-13082# Los Alamos National Lab., N. Mex.
FUNNELING: AN INITIAL BEAM DYNAMICS STUDY
F. W. Guy and T. P. Wangler 20 Apr. 1985 8 p refs Presented at the Workshop on High Brightness, High Current, High Duty Factor Ion Injectors, San Diego, Calif., 21 May 1985
(Contract W-7405-eng-36)
(DE85-012652; LA-UR-85-1625; CONF-8505164-1) Avail: NTIS HC A02/MF A01

Funneling two H(-) beams into a single beam of twice the current has been examined as a means of doubling beam current without significantly increasing transverse emittance. Using the PARMILA particle-following code, two 100-mA RFQ output beams at 2 MeV were injected into idealized transport lines for merging two beams into one. Two approaches were studied: (1) the minimum-element method, in which a minimum number of discrete elements such as quadrupole triplets, buncher cavities, and bending magnets were used to transport and deflect the beam; and (2) the quasi-adiabatic method, in which a periodic lattice similar to the RFQ provided focusing and minimized abrupt changes in the beam environment. The minimum-element method resulted in an emittance growth ratio epsilon0/epsilon/sub i/ = 2.5, whereas the quasi-adiabatic emittance growth ratio was about 1.1 (albeit with an idealized line configuration). DOE

N86-13083# Los Alamos National Lab., N. Mex.
DEVELOPMENT OF A CURRENT MONITOR SYSTEM FOR MEASURING PULSED-BEAM CURRENT OVER A WIDE DYNAMIC RANGE
F. R. Gallegos, L. J. Morrison, and A. A. Browman 1985 4 p Presented at the Particle Accelerator Conf., Vancouver, British Columbia, 13 May 1985
(Contract W-7405-eng-36)
(DE85-012692; LA-UR-85-1527; CONF-850504-119) Avail: NTIS HC A02/MF A01

This report documents the development of a current transformer system to measure pulsed ion beam currents at the LAMPF accelerator. Measured peak currents typically range from 100 nA to 30 mA with pulse widths varying from 30 (MU)s to 1 ms. Signal conditioning of the peak current output provides an average current readout with a range of 1 nA to 2 mA, noise of approximately + or - 0.5 nA, and accuracy of + or - 0.1%. The system requires no operating adjustments and has proved stable and reliable during a year of operation. DOE

N86-13084# Los Alamos National Lab., N. Mex.
ELECTRON EMISSION OF OVER 200 A/cm (2) FROM A PULSED-LASER IRRADIATED PHOTOCATHODE
J. S. Fraser, C. H. Lee, P. E. Gettinger, E. R. Pugh, R. Klinkowstein, J. H. Jacob, and R. L. Sheffield 1985 4 p refs Presented at the Particle Accelerator Conf., Vancouver, British Columbia, 13 May 1985 Prepared in cooperation with Thermo Electron Corp., Waltham, Mass., Physical Sciences, Inc., Andover, Mass., and Science Research Corp., Cambridge, Mass.
(Contract W-7405-eng-36)
(DE85-012656; LA-UR-85-1621; CONF-850504-59) Avail: NTIS HC A02/MF A01

High current density, bunched electron beams with low emittance are required for efficient operation of RF linac driven free electron lasers (FELs). Laser irradiated, photoemissive electron sources are suitable for this application. Currents of over 200 A have been generated in an ultrahigh vacuum chamber from a 1-cm(2) Cs3Sb photocathode irradiated by a frequency doubled, Q switched pulse from a Nd:glass laser. These currents are over two times larger than previously reported from any photocathode. The duration of the electron pulse was 50 ns (FWHM), corresponding to the width of the 532 rm laser pulse. DOE

N86-13085# Fermi National Accelerator Lab., Batavia, Ill.
TESTS OF ORBITAL DYNAMICS USING THE TEVATRON
D. A. Edwards, R. P. Johnson, and F. Willeke Apr. 1985 9 p refs Presented at the Orbital Dyn. and Appl. to Accelerators Workshop, Berkeley, Calif., 7 Mar. 1985 Prepared in cooperation with Deutsches Elektronen-Synchrotron, Hamburg, West Germany
(Contract DE-AC02-76CH-03000)
(DE85-012296; FNAL/C-85/59; CONF-8503105-5) Avail: NTIS HC A02/MF A01

Measurements of Tevatron beam behavior relevant to questions of orbital dynamics are described. General techniques and some preliminary results from phase space distortion experiments are presented. DOE

N86-13086# Pacific Northwest Lab., Richland, Wash.
SECONDARY ELECTRON SPECTRA: A SEMIEMPIRICAL MODEL
J. H. Miller, W. E. Wilson, and S. T. Manson May 1985 18 p refs Presented at the 8th Symp. on Microdosimetry, Toulouse, 20 May 1985 Prepared in cooperation with Georgia State Univ., Atlanta
(Contract DE-AC06-76RL-01830)
(DE85-012448; PNL-21-12756; CONF-850506-7) Avail: NTIS HC A02/MF A01

A model based on evaluation of coefficients in Bethe's asymptotic expansion of the first Born approximation has been developed to extend the data base of differential ionization cross sections needed in track structure calculations. The coefficient of the lowest-order term in this expansion is related to the photoionization cross section of the target, but optical data alone are generally not sufficient to determine differential cross sections for ionization by charged particles. We have used proton-impact, differential ionization data to evaluate the coefficient of the next higher-order term in the expansion. Since these coefficients are independent of the projectile, the experimentally derived coefficients can be used to predict differential cross sections for ionization of the target by bare ions and electrons that are sufficiently energetic to make the Bethe theory valid. This paper compares model calculations with recent experimental data on ionization of water vapor by high-energy electrons and protons. DOE

N86-13087# Los Alamos National Lab., N. Mex.
FMIT DIAGNOSTIC INSTRUMENTATION
J. D. Gilpatrick and D. D. Chamberlin 1985 4 p refs Presented at the Particle Accelerator Conf., Vancouver, British Columbia, 13 May 1985
(Contract W-7405-eng-36)
(DE85-012668; LA-UR-85-1609; CONF-850504-93) Avail: NTIS HC A02/MF A01

The Fusion Materials Irradiation Test facility (FMIT) CW prototype accelerator has noninterceptive beamline instrumentation to measure beam parameters. The transverse emittances and beam profiles are measured with an array of photodiode sensors viewing light emitted from the beam region. Tomographic reconstructions of both spatial-density distributions and of transverse-emittance distributions are performed throughout a quadrupole focusing section. Beam bunches passing through capacitive probes produce bipolar waveforms whose zero crossing corresponds to the bunch's longitudinal centroid. By measuring the time required for a bunch to travel the known distance between two probes, velocity and energy are determined. A toroidal transformer measures the average ac beam current. Beam still is measured by a set of movable jaws that intercept the beam edges. Each jaw contains a water flow channel whose flow rate and differential temperature are measured to derive a transverse power distribution. Beam centroid position is measured by a four-lobe, magnetic-loop pickup. DOE

N86-13088# Sandia National Labs., Albuquerque, N. Mex.
LARGE SCALE OPERATIONAL PULSED POWER RESEARCH FACILITIES: HOW WELL HAVE WE MADE THEM A REALITY
G. D. Peterson, S. A. Goldstein, G. T. Holman, and W. H. McAtee 1985 6 p Presented at the 5th IEEE Pulsed Power Conf., Washington, D.C., 10 Jun. 1985
(Contract DE-AC04-76DP-00789)
(DE85-013784; SAND-84-2497C; CONF-850616-47) Avail: NTIS HC A02/MF A01

Many factors contribute to the successful long term operation of large scale, multiterawatt pulsed power facilities. Some of these

are: staffing considerations for optimum operational effectiveness including the impact of manpower inertia and operational mode momentum, effective management of the factors that govern experimental shot rate, and hardware preventive maintenance scheduling considerations on multimodule operational accelerators. The strategies used to keep large facilities operational at optimum performance including the merits of planning to accommodate component failure will be discussed by presenting specific solutions to problems on the Particle Beam Fusion Accelerator-I (PEFA-I) at Sandia. DOE

N86-13089# Argonne National Lab., Ill.
PARTITION OF CROSS SECTIONS IN ASYMMETRIC NUCLEUS-NUCLEUS REACTIONS AND THE ORIGIN OF FAST ALPHA PARTICLES
R. H. Siemssen 1985 22 p refs Presented at the Conf. on Nucl. Struct. with Heavy Ions, Legnaro, Italy, 27 May 1985 Prepared in cooperation with Groningen Rijksuniversiteit, Netherlands
(Contract W-31-109-eng-38)
(DE85-014989; CONF-8505172-2) Avail: NTIS HC A02/MF A01

To investigate the mechanism of asymmetric nucleus-nucleus reactions from the coulomb barrier to intermediate energies the (14) N + (159)Tb reaction was studied at five bombarding energies between 8 and 23 MeV/u via particle-particle correlations (at selected energies) and particle KX-ray coincidences to identify the specific reaction channels. With the KX-ray method partial cross sections for projectile-like fragments (PLF) as a function of the atomic number (Z/sub res/) of the residual nucleus can be determined. The charge balance yields the missing charge dZ = Z/sub proj/ + Z/sub targ/ - Z/sub PLF/ - Z/sub TIF/ that indicates whether, in addition to the PLF, other charged particles are emitted. A large fraction of the inclusive cross sections is found to originate from such channels with two or more fragments in the exit channel, and this fraction increases as the PLF is further removed in mass from the incident projectile, and with increasing bombarding energy. From the particle-particle correlation studies it is found that sequential decays of PLFs are dominant. Non-sequential processes, if present, are associated with inelastic reactions involving excitations of both projectile and target. From (GAMMA)-ray multiplicity measurements and from the broad distribution of the strength with Z/sub res/ it is concluded that these alpha particles originate from inelastic (damped) processes. DOE

N86-13090# Arizona State Univ., Tempe.
HIGH NUCLEAR TEMPERATURES BY ANTIMATTER-MATTER ANNIHILATION
W. R. Gibbs and D. Strottman 1985 12 p refs Presented at the Conf. on Antinucleon and Nucleon-Nucleus Interactions, Telluride, Colo., 18 Mar. 1985 Prepared in cooperation with LANL
(DE85-014113; LA-UR-85-2075; CONF-850315-8) Avail: NTIS HC A02/MF A01

It is suggested that the quark-gluon phase be created through the use of antiproton or antideuteron beams. The first advantage to this method, using higher energy antiprotons than 1.5 GeV/c, is that the higher momenta antiprotons penetrate more deeply so that mesons produced are more nearly contained within the nucleus. Another advantage is that the annihilation products are very forward-peaked and tend to form a beam of mesons so that the energy density does not disperse very rapidly. Calculations were performed using the intranuclear cascade to try to follow the process of annihilation in some detail. The intranuclear cascade type calculation method is compared to the hydrodynamic approach. DOE

N86-13091# Argonne National Lab., Ill.
REVIEW OF HEAVY ION COLLIDER PROPOSALS
A. G. Ruggiero 1985 6 p Presented at the Particle Accelerator Conf., Vancouver, British Columbia, 13 May 1985
(Contract W-31-109-eng-38)
(DE85-014985; ANL/EEP-CP-85-43; CONF-850504-211) Avail: NTIS HC A02/MF A01

In this paper we review proposals for heavy-ion colliders generated during the last few years for several national laboratories. The proposals span over a large range of energy and luminosity to accommodate the experimental needs of both the nuclear and the high-energy physicists. We report also briefly efforts in the same field happening in Europe. DOE

N86-13092# California Univ., Berkeley. Lawrence Berkeley Lab.
ACHIEVEMENT OF BEVALAC RAPID MODE SWITCHING
F. Lothrop, R. Stevenson, R. Miller, and J. Alonso May 1985 6 p Presented at the Particle Accelerator Conf., Vancouver, British Columbia, 13 May 1985
(Contract DE-AC03-76SF-00098)
(DE85-015130; LBL-18939; CONF-850504-220) Avail: NTIS HC A02/MF A01

Rapid changes of ion, intensity, beam line, and output energy between two modes have been achieved. The techniques for switching among the Bevalac's several injectors are described. Energy level limits at the output (for q/A = 1/2) are 470 to 2100 MeV/n (high power) or 50 to 1050 MeV/n (low power). Depending on specific field value differences, the total time required for a mode change is less than one minute. This mode of operation greatly improves program efficiency in interleaving medical and nuclear science programs at the Bevalac. DOE

N86-13093# California Univ., Berkeley. Lawrence Berkeley Lab.
OVERVIEW AND STATUS OF THE TRANSVERSE-FIELD FOCUSING (TFF) ACCELERATOR
O. A. Anderson, C. F. Chan, W. S. Cooper, J. W. Kwan, C. A. Matuk, H. M. Owren, J. A. Paterson, P. Purgalis, and L. Soroka May 1985 6 p refs Presented at the Particle Accelerator Conf., Vancouver, British Columbia, 13 May 1985
(Contract DE-AC03-76SF-00098)
(DE85-015278; LBL-19593; CONF-850504-225) Avail: NTIS HC A02/MF A01

The Transverse Field focusing (TFF) system described here is a prototype for a negative-ion based neutral beam line with possible applications in the US magnetic fusion energy program. The prototype system consists of four main modules: (1) H(-) source, (2) 80 keV pre-accelerator, (3) TFF matching/pumping (M/P) section, and (4) 180 keV TFF accelerator. The first three modules have been installed on the beam line, with the fourth to follow soon. The crucial module, invoking the most difficult (and interesting) physics and engineering issues, is the M/P section. It performs: (1) gas removal from the beam by differential pumping, (2) electron removal, (3) beam thickness reduction to match the TFF accelerator parameters, and (4) beam-edge confinement. The four beamline modules are discussed in this survey, with emphasis on design features of the M/P section. DOE

N86-13094# Oak Ridge National Lab., Tenn.
MULTIPHOTON IONIZATION OF NO-RARE GAS VAN DER WAALS SPECIES
J. C. Miller 1985 3 p Presented at the 7th Intern. Conf. on Laser Spectry., Maui, Hawaii, 24 Jun. 1985
(Contract DE-AC05-84OR-21400)
(DE85-014650; CONF-850605-1) Avail: NTIS HC A02/MF A01

To date, most spectroscopic studies of electronic states of clusters involving small molecules and rare gas (RG) atoms have employed laser-induced fluorescence techniques. Consequently, such studies (e.g., levy and co-workers) on I2-RG species have been limited to the lowest lying electronic states, which are usually velance in character. Furthermore, the identification of the cluster often must be inferred from spectral shifts, pressure dependence, etc. We have applied the technique of multiphoton ionization (MPI) to the study of electronic spectroscopy of NO-RG van der Waals species and extended the previous experiments of SATO, et al. These works show several of the advantages of the MPI technique relative to the LIF method. Specifically, mass analysis can provide identification of the new species formed as well as allowing discrimination against other species (the parent monomer or higher clusters) while recording spectra. Futhermore, the use of MPI photoelectron spectroscopy can provide data on the states of the cluster ion as well. DOE

N86-13095# California Univ., Berkeley. Lawrence Berkeley Lab.
ON-LINE VELOCITY MEASUREMENTS USING PHASE PROBES AT THE SUPERHILAC
B. Leemann, D. Brodzik, B. Feinberg, and D. Howard May 1985 6 p ref Presented at the Particle Accelerator Conf., Vancouver, British Columbia, 13 May 1985
(Contract DE-AC03-76SF-00098)
(DE85-015279; LBL-18961; CONF-850504-226) Avail: NTIS HC A02/MF A01

Phase probes have been placed in several external beam lines at the SuperHILAC to provide velocity measurements independent of the type of particle being accelerated. The system uses three probes in each line to obtain accurate velocity measurements at all beam energies. Automatic gain control and signal analysis are performed so that the energy/nucleon along with a representative probe signal are displayed on an oscilloscope every eight seconds. The system is accurate to within about +-0.25%, and has provisions for on-line calibration tests. The phase probes thus provide a velocity measurement independent of the mass defect associated with the use of crystal detectors, which can become significant for heavy elements. DOE

N86-13096# Hughes Aircraft Co., Torrance, Calif. Electron Dynamics Div.
DEVELOPMENT PROGRAM FOR A 200 kW, cw GYROTRON Final Report
W. J. DeHope, P. E. Ferguson, S. L. Hart, V. A. Matranga, J. J. Sandoval, M. J. Schmitt, J. J. Tancredi, and M. A. Wozniak Feb. 1984 122 p
(Contract DE-AC05-87OR-21400)
(DE85-014887; ORNL/SUB-79/33200/18) Avail: NTIS HC A06/MF A01

Development of a millimeter-wave device to produce 200 kW of continuous wave power at 60 GHz is described. The device, a gyrotron oscillator, is intended for electron-cyclotron heating of fusion plasmas. The design philosophy is herein discussed and experimental results, both diagnostic and long pulse, are given. DOE

N86-13097# Fermi National Accelerator Lab., Batavia, Ill.
A p ANTI p COLLIDER PHYSICS: SUMMARY TALK
J. D. Bjorken Jun. 1985 24 p refs Presented at the Intern. Symp. on Phys. of Proton-Antiproton Collision, Tsukuba, Japan, 13 May 1985
(Contract DE-AC02-76CH-03000)
(DE85-014782; FNAL/C-85/84; CONF-8503151-2) Avail: NTIS HC A02/MF A01

Progress is very briefly summarized in these areas: Drell-Yan production of W and Z; inclusive spectra of jets; angular distribution of two jet final states; Dalitz plot analysis of three jet final states; interior structure of jets; minijets; issues and relevent data in soft-collision physics; structure of the pomeron; W, Z, and electroweak theory; heavy quark, and possibly anomalous same-sign isolated dimuons. Future directions are anticipated for the Sp anti pS, Tevatron I, instrumentation and detectors, group theory, and the physics at SSC energies. DOE

N86-12435# Joint Publications Research Service, Arlington, Va.
MEASUREMENT OF 1 NANOSECOND WIDE BEAMS FOR 2.5 MeV PROTON ACCELERATOR
Yang Jiayou, Li Wenxue, and Li Jiarong *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-034) 1 Oct. 1985 p 71-77 refs Transl. into ENGLISH from He Kexue Yu Gongcheng (Beijing), no. 1, Mar. 1984 p 67-71 (For primary document see N86-12430 03-31)
Avail: NTIS HC A08/MF A01

73 NUCLEAR AND HIGH-ENERGY PHYSICS

Includes elementary and nuclear particles; and reactor theory.

For space radiation see *93 Space Radiation.*

N86-13098# Nova Univ., Dania, Fla. Jolla Ca.
THEORY SUPPORT OF PULSED POWER EXPERIMENTS. VOLUME 3. E-BEAM CHAMBER DESIGN Technical Report, 15 Nov. 1978 - 30 Sep. 1982
A. Wilson, D. E. Parks, E. M. Waisman, M. C. Friedman, and P. G. Steen 1 Jul. 1984 26 p
(Contract DNA001-79-C-0027)
(AD-A158417; AD-E301765; SSS-R-84-6709-3-Vol-3; DNA-TR-84-288-V3-Vol-3) Avail: NTIS HC A03/MF A01 CSCL 20/5

The progress made in understanding the physics of X-ray simulators is presented. The work includes sections on diode power flow, plasma stability and dynamics, e-beam test chambers and the DNA BACCARAT program. GRA

N86-13099# Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho.
GROUND TEST FACILITY FOR NUCLEAR TESTING OF SPACE REACTOR SUBSYSTEMS
W. J. Quapp and K. D. Watts 1985 4 p Presented at the 2nd Symp. on Space Nucl. Power Systems, Albsuquerque, N. Mex., 14 Jan. 1985
(Contract DE-AC07-76ID-01570)
(DE85-014634; EGG-M-13484; CONF-850103-11) Avail: NTIS HC A02/MF A01

Two major reactor facilities at the INEL have been identified as easily adaptable for supporting the nuclear testing of the SP-100 reactor subsystem. They are the Engineering Test Reactor (ETR) and the Loss of Fluid Test Reactor (LOFT). In addition, there are machine shops, analytical laboratories, hot cells, and the supporting services (fire protection, safety, security, medical, waste management, etc.) necessary to conducting a nuclear test program. This paper presents the conceptual approach for modifying these reactor facilities for the ground engineering test facility for the SP-100 nuclear subsystem. DOE

N86-13100# Argonne National Lab., Ill.
MULTIPLICITIES IN HIGH ENERGY INTERACTIONS
M. Derrick 13 May 1985 52 p refs Presented at the Aspen Winter Phys. Conf., Aspen, Colo., 14 Jan. 1985
(Contract W-31-109-eng-38)
(DE85-013847; ANL-HEP-CP-85-17; CONF-850146-7) Avail: NTIS HC A04/MF A01

Data on multiplicities in high energy interactions are reviewed. Results from e(+)e(-) annihilation, from neutrino interactions, and from hadronic collisions, both diffractive and nondiffractive, are compared and contrasted. The energy dependence of the mean charged multiplicity, <n/sub ch>, as well as the rapidity density at Y = 0 are presented. For hadronic collisions, the data on neutral pion production shows a strong correlation with <n/sub ch>. The heavy particle fractions increase with (RADICAL) s up to the highest energies. The charged particle multiplicity distributions for each type of reaction show a scaling behavior when expressed in terms of the mean. Attempts to understand this behavior, which was first predicted by Koba, Nielsen, and Olesen, are discussed. The multiplicity correlations and the energy variation of the shape of the KNO scaling distribution provide important constraints on models. Some extrapolations to the energies of the Superconducting Super Collider are made. DOE

N86-13101# Fermi National Accelerator Lab., Batavia, Ill.
TEVATRON GLOBAL RADIUS AND Os SYSTEM
S. Bristol, C. Kerns, Q. Kerns, and H. W. Miller Jun. 1985 4 p refs Presented at the Particle Accelerator Conf., Vancouver, British Columbia, 13 May 1985

(Contract DE-AC02-76CH-03000)
(DE85-017442; FNAL-TM-1328; CONF-850504-269) Avail: NTIS HC A02/MF A01

It has been found to be practical to extract a turn-average measurement of bunch beam phase relative to cavity gap voltage. This 0s signal shows the bunch position on the RF wave throughout injection, acceleration and extraction, including coherent synchrotron oscillations when present. In turn, the time derivative of 0s is a direct measure of global radial position error. We use the 0s signal, driving a phase shifter in the RF low-level system, to damp coherent synchrotron oscillations. Design and operation is discussed including single beam bunch operation if available. DOE

N86-13102# Los Alamos National Lab., N. Mex.
CHEMISTRY OF BERKELIUM: A REVIEW
D. E. Hobart and J. R. Peterson 1985 5 p Presented at ACTINIDES '85, Aix-en-Provence, France, 1 Sep. 1985 Prepared in cooperation with Tennessee Univ., Knoxville and ORNL
(Contracts DE-AS05-76ER-04447; DE-AC05-84OR-21400; W-7405-eng-36)
(DE85-017523; LA-UR-85-3112; CONF-8509147-2) Avail: NTIS HC A02/MF A01

Element 97 was first produced in December 1949, by the bombardment of americium-241 with accelerated alpha particles. This new element was named berkelium (Bk) after Berkeley, California, the city of its discovery. In the 36 years since the discovery of Bk, a substantial amount of knowledge concerning the physicochemical properties of this relatively scarce transplutonium element was acquired. All of the Bk isotopes of mass numbers 240 and 242 through 251 are presently known, but only berkelium-249 is available in sufficient quantities for bulk chemical studies. About 0.7 gram of this isotope was isolated at the HFIR/TRU Complex in Oak Ridge, Tennessee in the last 18 years. Over the same time period, the scale of experimental work using berkelium-249 has increased from the tracer level to bulk studies at the microgram level to solution and solid state investigations with milligram quantities. Extended knowledge of the physicochemical behavior of berkelium is important in its own right, because Bk is the first member of the second half of the actinide series. In addition, such information should enable more accurate extrapolations to the predicted behavior of heavier elements for which experimental studies are severely limited by lack of material and/or by intense radioactivity. DOE

N86-13103# Stanford Linear Accelerator Center, Calif.
DATA ACQUISITION SYSTEM FOR SLD
D. J. Sherden May 1985 6 p Presented at the 4th Topical Conf. On Computerized Data Acquisition in Particle and Nucl. Phys., Chicago, 19 May 1985
(Contract DE-AC03-76SF-00515)
(DE85-014361; SU-SLAC-Pub-3695; CONF-850579-10) Avail: NTIS HC A02/MF A01

This paper describes the data acquisition system planned for the SLD detector which is being constructed for use with the SLAC Linear Collider (SLC). An exclusively FASTBUS front-end system is used together with a VAX-based host system. While the volume of data transferred does not challenge the band-width capabilities of FASTBUS, extensive use is made of the parallel processing capabilities allowed by FASTBUS to reduce the data to a size which can be handled by the host system. The low repetition rate of the SLC allows a relatively simple software-based trigger. The principal components and overall architecture of the hardware and software are described. DOE

N86-13104# Stanford Linear Accelerator Center, Calif.
HIGH AND ULTRA-HIGH GRADIENT QUADRUPOLE MAGNETS
W. O. Brunk and D. R. Walz May 1985 4 p Presented at the Particle Accelerator Conf., Vancouver, British Columbia, 13 May 1985
(Contract DE-AC03-76SF-00515)
(DE85-014360; SU-SLAC-Pub-3672; CONF-850504-185) Avail: NTIS HC A02/MF A01

Small bore conventional dc quadrupoles with apertures from 1 to 2.578 cm were designed and prototypes built and measured. New fabrication techniques including the use of wire electric discharge milling (EDM) to economically generate the pole tip contours and aperture tolerances are described. Magnetic measurement data from a prototype of a 1cm aperture quadrupole with possible use in future e(+)/e(-) super colliders are presented. At a current of 400A, the lens achieved a gradient of 2.475 T/cm, and had an efficiency of 76.6%. DOE

N86-13105# Lawrence Livermore National Lab., Calif.
MEASUREMENTS AND CALCULATIONS OF NEUTRON SCATTERING ANGULAR DISTRIBUTIONS OVER A WIDE MASS AND ENERGY RANGE
I. F. Hansen May 1985 13 p refs Presented at the Intern. Conf. on Nucl. Data for Basic and Appl. Sci., Santa Fe, N. Mex., 13 May 1985
(Contract W-7405-eng-48)
(DE85-012912; UCRL-92666; CONF-850507-19) Avail: NTIS HC A02/MF A01

Neutron elastic and inelastic differential cross sections for targets between (9)Be and (239)Pu at energies, E > 14 MeV have been measured using the Livermore and Ohio University neutron time-of-flight facilities. We review here the data and the analyses based on two local microscopic optical potentials: that of Jeukenne, Lejeune and Mahaux, and that of Brieva and Rook. The results are also compared with calculations using global potentials. Coupled channel formalism has been used in the analysis of targets with strong deformations, such as Be, C, Ta, and actinides. The value of the microscopic optical potentials as a tool to predict elastic and inelastic neutron cross sections over a wide mass and energy range is discussed. The need for neutron measurements up to higher energies and their analysis in conjunction with (p,p) and charge exchange (p,n) data is addressed. DOE

N86-13106# Los Alamos National Lab., N. Mex.
ISOVECTOR RESONANCES IN PION CHARGE EXCHANGE
J. D. Bowman 1985 5 p Presented at the Symp. on Nucl. Struct., Copenhagen, 20 May 1985
(Contract W-7405-eng-36)
(DE85-012746; LA-UR-85-1777; CONF-85051661) Avail: NTIS HC A02/MF A01

The ((PI) (+-), (PI) (0)) reactions as probes of isovector resonances are discussed. Experimental observation of the isovector monopole resonance is reported. Experimental results are presented for L = 0, 1, and 2 isovector resonances and are compared to random-phase approximation calculations. DOE

N86-13107# Los Alamos National Lab., N. Mex.
SHOCKING BEHAVIOR OF FLUID FLOW IN DEFORMABLE JOINTS
H. Murphy and Z. Dash 1985 14 p Presented at the Intern. Symp. on Geothermal Energy, Kailua Kona, Hawaii, 26 Aug. 1985
(Contract W-7405-ent-36)
(DE85-010104; LA-UR-85-1007; CONF-850801-13) Avail: NTIS HC A02/MF A01

If fluid is injected into joints in rock masses, several types of joint deformations can take place. At first the pressure rise in the joint is small enough that the joint does not actually open. Nevertheless the effective closure stress, i.e., the difference between the total earth stress acting normal to the joint plane and the fluid pressure, is reduced. Consequently the tightness of joint closure is lessened, resulting in a small increase of the effective open space, or aperture, of the joint. If the fluid pressure rise is small enough, the aperture can still be treated as nearly constant, and the pressure response therefore follows the usual laws of linear diffusion. But if the pressure increase is large, aperture increases must be accounted for, and the flow will be affected by nonlinear diffusion due to pressure-dependent aperture, as well as a new storativity term due to joint compressibility. Eventually the fluid pressure may attain a value equal to, and even slightly greater than, the original total earth stress, and the opposing surfaces of the rock that meet at the joint can actually part. We refer to this behavior as joint lift off, or jacking. During lift off, the

changes in joint aperture and compressibility are very large compared to changes while the joint is still in roughness-to-roughness contact and the flow equation becomes so highly nonlinear that pressure pulses are no longer transmitted in a smooth, diffusive manner, but more like a propagating shock wave. DOE

N86-13108# Sandia National Labs., Albuquerque, N. Mex.
IBEX MAGNETIC COUPLING EXPERIMENTS
C. A. Frost, P. D. Kiekel, R. B. Miller, C. A. Ekdahl, J. Wagner, and J. J. Ramirez 1985 5 p Presented at the SDIO/DARPA Ann. Propagation Rev., Monterey, Calif., 24 Jun. 1985
(Contract DE-AC04-76DP-00789)
(DE85-014331; SAND-85-1460C; CONF-8506141-4) Avail: NTIS HC A02/MF A01

The magnetic coupling of one pulse to another is a key issue for some modes of high-current beam propagation. Experiments are in progress on Sandia's IBEX accelerator to address issues relevant to magnetic coupling. The IBEX experiments differ from previous experiments in that the B/sub theta/ field acting on the second pulse is the result of residual plasma current from the first pulse rather than current applied by an external means. This new feature makes the propagation sensitive to beam and plasma current profiles that are key to the physics of the magnetic coupling problem. These experiments do not attempt to study the air chemistry issues, as this would require much higher current densities than are available from IBEX. We are using the IBEX accelerator with a mismatched magnetized diode to produce two high-current pulses separated by approx. 130 nsec. A pulse pair has been propagated over a 1.5-m path in low pressure air. Extraction of two pulses, each having different parameters, complicates the experiment but also provides new insight into the magnetic coupling problem. DOE

N86-13109# Sandia National Labs., Albuquerque, N. Mex.
RADLAC PROGRAM STATUS
C. A. Ekdahl and R. W. Iemke 1985 4 p Presented at the SDIO/DARPA Ann. Propagation Rev., Monterey, Calif., 24 Jun. 1985 Prepared in cooperation with AFWL, Kirtland AFB, N. Mex.
(Contract DE-AC04-76DP-00789)
(DE85-014708; SAND-85-1453C; CONF-8506141-7) Avail: NTIS HC A02/MF A01

Regardless of the propagation mode, the critical physics issue facing the use of intense relativistic electron beams in the lower atmosphere is the stability of the first pulse. The ATA was built at LLNL to address this question for low-current beams, and in RADIAC II at Sandia we now have the means for resolving the lead pulse stability issue for high-current beams. RADLAC II is now operational, and we can proceed with experiments that have the objective of demonstrating that the instabilities on a propagating beam with current greater than 40 KA can be suppressed to a maximum amplitude less than a beam radius. DOE

N86-13110# Los Alamos Scientific Lab., N. Mex.
EXPERIMENT TO STUDY K(+) (YIELDS) (PI)(+) + NOTHING AT LAMPF 2
D. R. Marlow May 1985 8 p refs
(Contract W-7405-eng-36)
(DE85-014267; LA-10395-MS) Avail: NTIS HC A02/MF A01

An experiment to measure K(+) (YIELDS) (PI) (+) nothing (where nothing denotes unobservable neutral particles) at LAMPF II is described. This experiment is capable of measuring one K(+) (YIELDS) (PI) (+) nu anti nu event for branching ratio of 10(-12). DOE

N86-13111# Lawrence Livermore National Lab., Calif.
HIGH INTENSITY POSITRON BEAM AND ANGULAR CORRELATION EXPERIMENTS AT LIVERMORE
R. H. Howell, I. J. Rosenberg, P. Meyer, and M. J. Fluss Mar. 1985 5 p Presented at the 7th Intern. Conf. on Positron Annihilation, New Delhi, 6 Jan. 1985 Prepared in cooperation with Argonne National Lab., N. Mex.
(Contract W-7405-eng-48)
(DE85-012961; UCRL-90936; CONF-850169-12) Avail: NTIS HC A02/MF A01

A positron beam apparatus that produces a variable energy positron beam with sufficient intensity to perform new positron experiments in an ultrahigh vacuum environment has been installed at the Lawrence Livermore 100 MeV electron linac. We have installed two large area position sensitive gamma-ray detectors to measure angular correlations in two dimensions and a separate highly collimated detector to measure positronium energy distributions by time-of-flight velocity determination. Data from measurements on single crystals of Cu will be described. DOE

N86-13112# Lawrence Livermore National Lab., Calif.
NUCLEAR PERFORMANCE OPTIMIZATION OF THE Be/Li/Th BLANKET FOR THE FUSION BREEDER
J. D. Lee and B. R. Bandini 26 Feb. 1985 7 p Presented at the 6th Topical Meeting on the Technol. of Fusion Energy, San Francisco, 3 Mar. 1985 Prepared in cooperation with Pennsylvania State Univ., University Park
(Contract W-7405-eng-48)
(DE85-012949; UCRL-92252; CONF-850310-111) Avail: NTIS HC A02/MF A01

More rigorous nuclear analysis, including treatment of resonance self shielding effects coupled with an optimization procedure, has resulted in improved performance of the Be/Li/Th blanket. Net U-233 breeding ratio has increased 36% (to 0.84) while at an average U-233/Th ratio of 0.5 a/o average energy multiplication has increased only 12% (to 2.1) compared with earlier results. DOE

N86-13113# Maryland Univ., College Park.
ACCELERATOR RESEARCH STUDIES
Nov. 1984 75 p
(Contract DE-AS05-78ER-05940)
(DE85-014878; DOE/ER-05940/T1) Avail: NTIS HC A04/MF A01

During the past contract period, major progress was made in both tasks of the accelerator research program in the Charged Particle Beam Laboratory at the University of Maryland. The major event in Task A was the completion of phase two of the transport channel. This phase consists of 12 lenses in addition to the two matching lenses. The first measurements of beam transport indicate 100% beam transmission in the range 40(0) < sigma0 < 90(0). Major highlights in Task B were new results in collective acceleration from laser-produced plasmas (considerably higher ion energies and currents than reported previously), successful studies of electron beam propagation in drift-tube and helix structures, construction of a novel, compact pulse-powered generator as well as new ion and electron spectroscopy results in the plasma focus area. DOE

N86-13114# Washington Univ., Seattle. Dept. of Physics.
CONFERENCE SUMMARY: ANTINUCLEON- AND NUCLEON-NUCLEUS INTERACTIONS
L. Wilets 1985 13 p Presented at the Conf. on Antinucleon and Nucleon-Nucleus Interactions, Telluride, Colo., 18 Mar. 1985
(Contract DE-AC06-81ER-40048)
(DE85-013905; DOE/ER-40048/10-N5) Avail: NTIS HC A02/MF A01

Topics summarized include: the hadronic substructure, the EMC effect, observations on relativity and the Dirac equation, and relativistic Lagrangian field theories for N-N interactions and nuclear matter. DOE

N86-13115# Brookhaven National Lab., Upton, N. Y.
LIGHT MASS ELEMENTS TOTAL HALF-LIVES FOR SELECTED LONG-LIVED NUCLIDES
N. E. Holden 1985 12 p refs Presented at Intern. Comm. for Radionuclide Metrology Meeting, Grenoble, France, 3 Jun. 1985
(Contract DE-AC02-76CH-00016)
(DE85-014217; BNL-NCS-36553; CONF-8506130-4) Avail: NTIS HC A02/MF A01

In the past, many compilations and evaluations of half lives

have been made which have uncritically accepted authors' values and uncertainties. They have merely recommended weight averaged reported results. This evaluation attempts to reanalyze each experiment in the literature including an estimate of the standard deviation utilizing, where possible, an estimate of the systematic error. This paper constitutes a preliminary step in the process of recommending values. The long lived nuclides of light elements are of interest for their use in dating methods and for calculating cosmic ray exposure ages of meteorites. Experimental data on the half lives of selected nuclides have been evaluated and recommended values and uncertainties are presented for the following nuclides: (3)H, (10)Be, (14)C, (26)Al, (39)Ar, (40)K, (50)V, (53)Mn, (76)Ge, (87)Eb, (92)Nb, (107)Pd, (113)Cd, (115)In and (123)Te. The impact of the recommended (14)C half life of 5715 years on the carbon dating techniques, which uses the Libby value of 5568 years, will be discussed. Also the possible primordial occurrence of (92)Nb is now definitely ruled out by the recommended half life of 3.7 x 10(7). Finally, based on the recommended (26)Al half life value, the (21)Ne production rate for calculating cosmic ray exposure ages remains too high, compared to rates using the (53)Mn and (10)Be half life values. DOE

N86-13116# GA Technologies, Inc., San Diego, Calif.
TRITIUM CONTROL IN HELIUM-COOLED BLANKETS
C. P. C. Wong, I. Maya, C. Kessel (California Univ., Los Angeles), D. Roelant (Michigan Univ., Ann Arbor), and K. R. Schultz Jun. 1985 12 p Presented at 2nd Natl. Topical Meeting on Tritium Technol. in Fission, Fusion and Isotropic Appl., Dayton, Ohio, 30 Apr. 1985
(Contract DE-AC03-84-ER-53158)
(DE85-014783; GA-A-17940; CONF-850405-16) Avail: NTIS HC A02/MF A01

As a part of the Blanket Comparison and Selection study (BCSS), GA Technologies as responsible for the design of helium-cooled, solid- and liquid-metal breeder blankets. Conceptual blanket designs are developed, including the consideration of the generation, transport, and extraction of tritium. Evaluations are made of the inventory and leakage of tritium for helium-cooled Li2O and LiAlO2 and liquid lithium breeder blankets for tokamak and tandem mirror reactors. To facilitate the evaluation, a solid breeder tritium code TRIT4 is developed. The results from this study indicate that tritium inventories and leakages are acceptable for the proposed helium-cooled blankets. An assumption made in the tritium leakage calculations is that tritium is released to the helium purge and coolant streams as T2 and remains in that form. If oxidation to T2O is possible, significant reduction in the tritium leakage will be possible. It is concluded that more experimental data on breeder material properties and tritium permeation behavior are needed. However, an adequate number of techniques is available to control the breeder tritium inventory and leakage to an acceptable level in helium-cooled solid- and lithium-breeder blankets. DOE

N86-13117# Brookhaven National Lab., Upton, N. Y.
PROMPT NEUTRON FISSION SPECTRUM MEAN ENERGIES FOR THE FISSILE NUCLIDES AND (252)Cf
N. E. Holden 1985 7 p refs Presented at Intern. Comm. for Radionuclide Metrology Meeting, Grenoble, France, 3 Jun. 1985 (DE85-012181; BNL-NCS-36552) Avail: NTIS HC A02/MF A01

The international standard for a neutron spectrum is that produced from the spontaneous fission of (252) Cf, while the thermal neutron induced fission neutron spectra for the four fissile nuclides, (233)U, (239)Pu, and (241)Pu are of interest from the standpoint of nuclear reactors. The average neutron energies of these spectra are tabulated. The individual measurements are recorded with the neutron energy range measured, the method of detection as well as the average neutron energy for each author. Also tabulated are the measurements of the ratio of mean energies for pairs of fission neutron spectra. DOE

N86-13118# Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho.
TRITIUM SAFETY ISSUES FOR TFCX
H. J. Reilly, S. J. Piet, and B. J. Merrill 1985 15 p Presented at the 2nd Natl. Topical Meeting on Tritium Technol. in Fission, Fusion and Isotopic Appl., Dayton, Ohio, 30 Apr. 1985
(Contract DE-AC07-76ID-01570)
(DE85-014621; EGG-M-20684; CONF-850405-14) Avail: NTIS HC A02/MF A01

Estimated tritium releases from the Tokamak Fusion Core Experiment are compared to the expected limits. A reaction kinetics model is described that predicts the conversion of tritium to the oxide form in free space. An analysis of the required capacity of the Emergency Tritium Cleanup System is also presented. The conclusions of this work are expected to be applicable to other experimental fusion devices that are now being considered. DOE

N86-13119# Brookhaven National Lab., Upton, N. Y.
SEARCH FOR NARROW STRUCTURE IN PROTON-ANTIPROTON ANNIHILATION CROSS SECTIONS FROM 1900 TO 1960 MeV
D. I. Lowenstein, D. C. Pealsee, R. J. Miller, R. A. Lewis, B. Y. Oh, G. A. Smith, J. Whitmore, T. Brando, L. Daftari, and A. deGuzman 1985 8 p Presented at the Intern. Conf. on Hadron Spectry., Coll. Park, Md., 20 Apr. 1985
(Contract DE-AC02-76CH-00016)
(DE85-013302; BNL-36569; CONF-8504133-3) Avail: NTIS HC A02/MF A01

The anti pp annihilation cross section has been measured with good resolution (approx. 2 MeV rms) in the mass range 1900-1960 MeV. No narrow structures are seen, the 90% confidence level upper limit being 8-12 mb-MeV for the integrated area of a resonance in this mass range. However, we do not rule out a very narrow bump dip structure seen in an earlier experiment in the 1935-1941 MeV mass interval. The data also do not support the existence of a broad structure previously reported at 1937 MeV. DOE

N86-13120# Washington Univ., Seattle. Inst. for Nuclear Theory.
DYNAMICAL MODEL OF QUARK REARRANGEMENT IN NUCLEON-ANTINUCLEON ANNIHILATION
G. A. Crawford, J. L. Dethier, L. Wilets, and M. Alberg (Seattle Univ.) May 1985 7 p refs Presented at Conf. on Antinucleon and Nucleon-Nucleus Interactions, Telluride, Colo., 18 Mar. 1985
(Contract DE-AC06-81ER-40048)
(DE85-013904; CONF-850315-6) Avail: NTIS HC A02/MF A01

The total inclusive cross-section for nucleon-antinucleon annihilation is being calculated, following a reaction mechanism in which the quarks undergo a rearrangement to form a doorway state consisting of a meson plus a two-quark, two-antiquark exotic. The soliton bag model is used for the quark interactions. Bag-bag dynamics are solved using the generator coordinate method formalism. DOE

N86-13121# Stanford Linear Accelerator Center, Calif.
PHYSICS OF e(+) - e(-) COLLIDERS: PRESENT, FUTURE AND FAR FUTURE
M. E. Peskin Oct. 1984 25 p refs Presented at 3rd Ann. Summer School on High Energy Accelerators, Upton, N.Y., 6 Jul. 1983
(Contract DE-AC03-76SF-00515)
(DE85-009895; SU-SLAC-Pub-3495; CONF-8307126-8) Avail: NTIS HC A02/MF A01

A lecture on e(+)-e(-) colliders contains the following: Section 2 reviews the features of e(+)-e(-) collisions according to the standard gauge theory of strong, weak, and electromagnetic interactions. This discussion reviews a few of the most important features of Ee(+)-e(-) collisions at currently accessible energies and the expectations for e(+)-e(-) reactions which produce the intermediate vector bosons Z(0) and W(+-). Section 3 reviews some of the experimental work done at the current generation of e(+)-e(-) colliders; this discussion emphasizes the search for new types of elementary particles. Section 4 is a theoretical digression, introducing a number of ideas about physics at the energy scale of 1 TeV. Section 5 discusses a number of technical aspects of

electron-positron colliders designed to reach the TeV energies. Finally, Section 6 discusses various possible effects which could appear in e(+)-e(-) collisions as the result of new physics appearing at 1 TeV or above. DOE

N86-13122# British Columbia Univ., Vancouver.
FASTBUS FOR THE PARTICLE ACCELERATOR LABORATORIES
W. K. Dawson, L. Costrell, H. Ikeda, P. J. Ponting, and H. V. Walz May 1985 3 p refs Presented at the Particle Accelerator Conf., Vancouver, British Columbia, 13 May 1985 Prepared in cooperation with NBS, Washington, D.C., National Lab. for High Energy Physics, Ibaraki, Japan, European Organization for Nuclear Research, Geneva, Switzerland and Stanford Linear Accelerator Center, Calif.
(DE85-014352; SU-SLAC-Pub-3697; CONF-850504-189) Avail: NTIS HC A02/MF A01

The FASTBUS modular high speed data acquisition and control system for high energy physics and other applications was described by Costrell and Dawson at the 1983 Particle Accelerator Conference. Both the specification and the implementation of this interlaboratory development have progressed considerably since that time. Because of its many attractive features, FASTBUS is currently in use in several major nuclear and high energy physics laboratories and is also finding application in other areas. DOE

N86-12407# Joint Publications Research Service, Arlington, Va.
MATHEMATICAL MODEL OF THE DYNAMIC RESPONSE OF THERMO-REGULATING IN 200 MeV LINEAR ACCELERATOR
Hu Defang and Ouyang Xiantai *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-035) 17 Oct. 1985 p 90-95 refs Transl. into ENGLISH from Zhongguo Kexue Jishu Daxue Xuebao (Hefei), v. 15, no. 2, Jun. 1985 p 217-222 (For primary document see N86-12399 03-31)
Avail: NTIS HC A08/MF A01

74 OPTICS

Includes light phenomena.

N86-13123 Department of the Navy, Washington, D. C.
OPTICAL SENSING DEVICES Patent
P. Shajenko, inventor (to Navy) Issued 11 Jun. 1985 6 p Supersedes AD-D011038
(AD-D011829; US-Patent-4,522,495; US-Patent-Appl-SN-503913; US-Patent-Class-356-345) Avail: US Patent and Trademark Office CSCL 17/8

This patent describes optical sensing devices comprising dual chamber apparati which use signal and reference light beams together with interferometric methods for detection of physical quantities of interest. The signal part of the chamber experiences the effects of a particular physical quantity to be measured which produce variations in the optical length of the light beam by movement of a mirror, thereby modulating that beam in proportion thereto. Concurrently, the reference beam, of equal pathlength, is passed through an adjacent chamber, isolated from such effects. The modulated signal beam and unmodulated reference beam are then combined to form a fringe pattern, the zero and first order fringes which are superimposed on apertures of an optical fibers, which carry the resultant light beams to a photodetector for converting the resultant light beams to a photodetectors for converting the optical signals to proportional electrical signals. GRA

N86-13124 Department of the Navy, Washington, D. C.
REVERSIBLE OPTICAL WAVEGUIDE VAPOR SENSOR Patent
J. F. Giuliani and H. Wohltjen, inventors (to Navy) Issued 23 Apr. 1985 5 p Supersedes AD-D010178
(AD-D011834; US-Patent-4,513,087; US-Patent-Appl-SN-462493; US-Patent-Class-436-96) Avail: US Patent and Trademark Office CSCL 09/1

A device for detecting small amounts of a chemical such as ammonia, and other ammonia-like molecules such as hydrazine or pyridine, in air and in other gases is disclosed. A capillary tube serves as a multiple total reflective medium for an optical beam from a light-emitting diode. The outer surface of the capillary tube is coated with a dye which, when exposed to the chemical, changes color so that the multiply reflected light is modified. The resultant change in the output light intensity from the capillary tube is photodetected and recorded to sense the presence of the chemical. When the chemical is removed, the dye returns to its original color so that the device can be reused. Author (GRA)

N86-13125# Department of the Army, Washington, D. C.
PHOTOSENSITIVE CARTRIDGE FOR WEAPONS ZEROING AND MARKSMANSHIP TRAINING Patent Application
F. N. Dyer and J. R. Schjelderup, inventors (to Army) Filed 3 May 1985 17 p
(AD-D011765; US-Patent-Appl-SN-730125) Avail: NTIS HC A02/MF A01 CSCL 19/1

The invention provides a light sensitive dummy cartridge for insertion into the chamber of a magazine-type weapon. A muzzle collimator is inserted into the barrel in alignment with the cartridge photosensor and the longitudinal axis of the bore. The power supply, audible scoring apparatus, and electrical circuit for the photosensor, moreover, are mounted in a dummy magazine. This combination provides an easy-to-install apparatus for temporarily converting a conventional firearm into a photoresponsive training device. This is a patent application. GRA

N86-13126# California Inst. of Tech., Pasadena.
ADAPTIVE OPTICAL FILTERING TECHNIQUES Final Technical Report, Apr. - Sep. 1984
D. Psaltis May 1985 31 p
(Contract F30602-81-C-0169)
(AD-A157072; RADC-TR-85-80) Avail: NTIS HC A03/MF A01 CSCL 20/6

The purpose of this study was to examine the potential of using optical information processing technology for adaptive antenna beamforming and null steering. The adaptive beamforming-/null steering problem consists of estimation of the covariance matrix of the noise field and inversion of the covariance matrix to obtain the antenna element weights which optimize the antenna's directional characteristics (gain pattern). This report examines the adaptive beamforming/nulling problem in view of the capabilities of optics and identifies areas where optics can be used to benefit. Benefits and drawbacks of various optical implementations of open and closed loop adaptive algorithms are discussed as well as the issues involved with optically processing digital binary numbers. GRA

N86-13127# Rome Air Development Center, Griffiss AFB, N.Y.
ANALYTIC MODELS FOR RADIATION INDUCED LOSS IN OPTICAL FIBERS. 3. TRANSIENT RADIATION EFFECTS
J. A. Wall Wright-Patterson AFB, Ohio AFWAL Feb. 1985 13 p
(AF Proj. 2306)
(AD-A157408; RADC-TR-85-39) Avail: NTIS HC A02/MF A01 CSCL 20/6

A number of physical models used to describe the recovery of transient radiation induced loss in optical fibers were evaluated and found unacceptable for various reasons. Based on an approximation to some of these models, the analytic expression L = a/(1 + b(t to the nth power)) where L = loss, time = time after pulse, and a, b, and n are constants, was formulated and found to give very good fits to transient radiation effects data obtained at RADC. GRA

N86-13128# University Coll., Galway (Ireland).
ELECTRO-OPTICAL TRANSMISSION AND LIQUID WATER CONTENT OF FOGS AND CLOUDS Final Technical Report
S. G. Jennings May 1985 73 p
(Contract DAJA37-81-C-0003)
(AD-A157506; R/D-2827-EN) Avail: NTIS HC A04/MF A01 CSCL 20/6

Research conducted during the term of this contract consisted of measurement of transmission and backscatter of electromagnetic (em) energy through water droplet clouds with known size distribution and liquid water content at visible and infra-red (IR) wavelengths. Theoretical analyses of relations between extinction, absorption and backscatter which incorporate size distribution dependencies were also made. Author (GRA)

N86-13129# Electronics Research Lab., Adelaide (Australia).
ATMOSPHERIC IR TRANSMISSION MEASUREMENTS IN A TROPICAL MARITIME ENVIRONMENT: COMPARISON WITH THE LOWTRAN 6 MODEL
D. R. Cutten Feb. 1985 38 p
(AD-A157920; ERL-0331-TM) Avail: NTIS HC A03/MF A01 CSCL 20/6

Broadband IR transmission data measured at a coastal, tropical maritime site have been compared with LOWTRAN 6 model predictions. Transmittance data for a 7 km path plotted as a function of absolute humidity have been examined in six spectral regions from 1.5 to 12 micrometers. A significant discrepancy, which increases with water vapor content, has been found between the measured and predicted data for the 8 to 12 micrometer region. This discrepancy is believed to be due to errors in the laboratory-determined self-broadening coefficients of water continuum absorption. Reasonable agreement has been obtained in the 4.4 to 5.4 micrometer and the 3.5 to 4.0 micrometer regions, particularly for the former region when water continuum absorption is included in the LOWTRAN model. GRA

N86-13130# Decilog, Inc., Melville, N. Y.
IMPROVEMENT OF MANUFACTURING TECHNIQUES AND QUALITY OF OPTICAL SCRATCH STANDARDS FOR FIRE CONTROL SYSTEMS
J. R. Goldgraben and J. Salerno Aug. 1985 53 p
(Contract DAAK10-81-C-0308)
(AD-A157963; AD-E401373; ARPAD-CR-85001) Avail: NTIS HC A04/MF A01 CSCL 20/6

Manufacture of the Optical Surface Quality Standards (Scratch and Dig) has been a problem since their introduction. The present technique of diamond scribing the scratch standard is haphazard mainly because there are no controlling dimensions for the scratch. The problem arises because there is no correlation between the physical and the visual parameters of the scratch. An evaluation was conducted of manufacturing techniques that would reliably reproduce the standards. Additionally, work was coordinated with the National Bureau of Standards who developed a measuring technique and generated a configuration for the new standard. The manufacturing process developed under this project utilized an electron beam writing instrument to produce the scratch pattern on photomasks. The photomasks were then processed by wet chemical etching to produce the scratch standards. The pattern generated was a 10-line pattern with individual line structure on the order of 1 micron in width. The results demonstrated a correlation of the scratch pattern to its visual appearance. However, the chemical etching produced low yield due to the non-repeatibility of the process. The results, therefore, while demonstrating for the first time a relationship between the physical characteristics and the visual appearance, also indicate that further refinement of the chemical etching portion of the process is necessary before the technique can be considered cost effective. GRA

N86-13131# Arizona Univ., Tucson.
MASKING OF LIGHT SCATTERING INFORMATION ON MATRIX ELEMENTS FROM COMPLEX SCATTERING Contractor Report, Sep. 1982 - Aug. 1984
W. S. Bickel Jul. 1985 73 p
(Contract DAAK11-82-K-0008)
(AD-A158144; CRDC-CR-85035) Avail: NTIS HC A04/MF A01 CSCL 20/6

Changes in light scattering curves due to perturbation on scattering systems are considered, using both measured data and, where possible, computer generated data. It is demonstrated that polydispersivity in size or real refractive index quickly destroys phase information from systems of perfect spheres, while absorption destroys phase information mainly in the backscatter directions and decreases the ratio of backscatter to forward scatter intensity. Several measured Mueller matrices are presented for perfect, bent, rotated, tilted, and surface roughened fibers, and for a highly irregular scatter, road dust. An introductory tutorial on the Mueller matrix description of light scatterings is included. GRA

N86-13132# Tetra Corp., Albuquerque, N. Mex.
UV SUSTAINED GLOW DISCHARGE OPENING SWITCH Final Report, 1 Jul. 1982 - 31 Dec. 1984
M. VonDadelszen and W. M. Moeny Jun. 1985 115 p
(Contract DAAG29-82-C-0018)
(AD-A158411; TETRA-TR-85-015; ARO-18965.2-PH) Avail: NTIS HC A06/MF A01 CSCL 09/1

This was a combined theoretical and experimental research program to determine discharge performance characteristics and the influence of various gas mixture additives on discharge performance for UV-sustained glow discharges. This research has a significant technological application in opening switches. The approach was a coordinated theoretical and experimental research effort to gain understanding of the characteristics and physics of UV-sustained glow discharges. A major portion of the research program was an experimental investigation of discharge physics using a single-pulse, UV-sustained 1.5 liter discharge chamber. By measuring discharge characteristics as a function of the electrode separation, pressure, applied voltage, source characteristics, and gas mixture, we determined the relationship between the gas mixture and the discharge kinetics, and between the UV-sustainer characteristics and the glow discharge performance characteristics. The experimental facility included the capability of studying the influence of seedants on discharge performance and measuring glow discharge kinetic rates. GRA

N86-13133# Sandia National Labs., Albuquerque, N. Mex.
RADIATION EFFECTS ON LIGHT SOURCES AND DETECTORS
C. E. Barnes 1985 15 p Presented at the Soc. of Photo-Optical Instr. Eng. Conf., Albuquerque, N. Mex., 1 Mar. 1985
(Contract DE-AC04-76DP-00789)
(DE85-014746; SAND-85-0685C; CONF-8503156-1) Avail: NTIS HC A02/MF A01

The rapidly expanding field of optoelectronics includes a wide variety of both military and non-military applications in which the systems must meet radiation exposure requirements. Herein, we review the work on radiation effects on sources and detectors for such optoelectronic systems. For sources the principal problem is permanent damage-induced light output degradation, while for detectors it is ionizing radiation-induced photocurrents. DOE

N86-13134# Los Alamos National Lab., N. Mex.
NEARLY IDEAL LENS OPTIMIZATION PROCEDURE
B. Brixner 1985 7 p refs Presented at the Intern. Lens Design Conf., Cherry Hill, N.J., 10 Jun. 1985
(Contract W-7405-eng-36)
(DE85-014116; LA-UR-85-2062; CONF-8506142-1) Avail: NTIS HC A02/MF A01

The Brixner lens optimization procedure, in which a lens design moves steadily toward diffraction-limited performance, samples lens performance with bundles of precisely traced skew rays, analyzes performance by calculating the image spot sizes and positions, and optimizes performance in a least squares system that minimizes the lateral ray deviations from their ideal image points. Minimizing the rms image spot size minimizes the rms optical path differences (OPDs). Minimizing the rms OPDs also optimizes the diffraction modulation transfer function (DMTF). Minimizing the image spot size and position errors also minimizes and balances the Seidel and high order aberrations. DOE

N86-13135# Los Alamos Scientific Lab., N. Mex. Materials Science and Technology Div.
STUDY OF POSSIBLE SOLARIZATION - RELATED IMPURITIES IN CaF2 AND OTHER FLUORIDES
Lawrence B. Edgett and Suzanne C. Stotlar 1985 7 p Presented

at the Southwest Conf. on Optics, Albuquerque, N. Mex., 4-8 Mar. 1985 Submitted for publication
(Contract W-7405-eng-36)
(DE85-014100; LA-UR-85-2157; CONF-850345-28) Avail: NTIS HC A02/MF A01

CaF2, MgF2 and SrF2 representative samples are obtained from three commercial single crystal sources. After repolishing their surfaces, all samples are subjected to spectographic quantitative spectrophotometry. A correlation of optical properties observed and trace impurities or dopants found by chemical analysis are observed, and details presented. DOE

N86-13136# Lawrence Livermore National Lab., Calif.
ESTIMATING THE RELIABILITY OF FIBER OPTICS CABLES
L. I. George 7 May 1985 23 p
(Contract W-7405-eng-48)
(DE85-014892; UCID-20459) Avail: NTIS HC A02/MF A01

This report estimates the reliability of fiber optics cables used in underground nuclear tests. Reliability is the probability of receiving signals transmitted from tests. This report uses the numbers of cable and fiber failures to estimate cable and fiber reliabilities. It uses cable and fiber reliability estimates to estimate the reliability of a signal transmission design, the probability of receiving at least one copy of each signal from a test. It shows that reliability estimates differ due to manufacturer, user, and depth of burial. And it shows one way to quantify the uncertainty in reliability estimates. This report should be used to help design reliable signal transmission systems. The data came from 43 tests done prior to FY 85 which used fiber optics cables. The users are Lawrence Livermore National Laboratory, Los Alamos National Laboratory, and Department of Defense. The data are numbers of fiber and cable failures, manufacturers and users, and depths of burial. Samples proportions estimate the fiber and cable reliabilities. Statistics test whether reliability estimates differ significantly between manufacturers and between users. Linear regression models failure rates as functions of depths of burial and tests whether failure rates depend on depths of burial. Probability theory quantifies the uncertainty in the reliability of one test with percentiles of the reliability estimate. Designers may use these results to compare alternatives for sending signals through fiber optics cables and to increase reliability with redundancy. DOE

N86-13137# National Oceanic and Atmospheric Administration, Boulder, Colo. Wave Propagation Lab.
FOLDED-PATH OPTICAL (C SUB n, SUP 2) INSTRUMENT
G. R. Ochs, D. S. Reynolds, and R. L. Zurawski Mar. 1985 33 p Sponsored in part by AFGL, Hanscom AFB, Mass.
(PB85-216398; NOAA-TM-ERL-WPL-123) Avail: NTIS HC A03/MF A01 CSCL 20F

An optical instrument that measures the refractive-index structure parameter (C sub n, sup 2) on a folded path to a cat's eye retroreflector is described. The measurement is heavily weighted toward the retroreflector. Using optimum path lengths of 150 to 250 meters, (C sub n, sup 2) can be measured over a range from 1 x 10 the -12th power to 1 x 10 to the -16th power (m to the -2/3 power). Author (GRA)

N86-12409# Joint Publications Research Service, Arlington, Va.
DETERMINATION OF SINGLE-MODE OPTICAL FIBER DISPERSION
Zhou Wenjun *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-017) 11 Jun. 1985 p 42-51 refs Transl. into ENGLISH from Tongxin Xuebao (Beijing), v. 5, no. 3, Jul. 1984 p 95-101 (For primary document see N86-12408 03-31)
Avail: NTIS HC A08/MF A01

N86-12414# Joint Publications Research Service, Arlington, Va.
STATE-OF-THE-ART OF OPTICS IN CHINA REVIEWED
Wang Daheng and Wo Xinneng *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-018) 12 Jun. 1985 p 50-65 refs Transl. into ENGLISH from Guangxue Xuebao (Shanghai), v. 5, no. 1, Jan. 1985 p 1-10 (For primary document see N86-12413 03-31)
Avail: NTIS HC A09/MF A01

N86-12415# Joint Publications Research Service, Arlington, Va.
SINGLE MODE PHASE LOCKING FIBEROPTIC SENSOR DEVELOPED
Wang Jinghua, Xie Haiming, Cui Jianhua, and Li Dazhong *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-018) 12 Jun. 1985 p 66-69 refs Transl. into ENGLISH from Yingyong Jiguang (Shanghai), v. 5, no. 1, Feb. 1985 p 43-44 (For primary document see N86-12413 03-31)
Avail: NTIS HC A09/MF A01

N86-12416# Joint Publications Research Service, Arlington, Va.
PRACTICAL OPTICAL MULTICHANNEL ANALYZER DEVELOPED
Chen Jian, Li Weiliang, Wan Wanlun, Lin Weizhu, and Li Wenchong *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-018) 12 Jun. 1985 p 70-77 refs Transl. into ENGLISH from Yingyong Jiguang (Shanghai), v. 5, no. 1, Feb. 1985 p 45-48 (For primary document see N86-12413 03-31)
Avail: NTIS HC A09/MF A01

N86-12417# Joint Publications Research Service, Arlington, Va.
DEVELOPMENT OF BEAM OPTICS FOR A 200 keV ION IMPLANTER
Pan Xianzheng, Fan Xiangjin, Xu Zaigui, and Guo Huaigui *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-018) 12 Jun. 1985 p 78-88 refs Transl. into ENGLISH from Wuhan Daxue Xuebao (Wuhan), no. 4, Dec. 1984 p 35-40 and 56 (For primary document see N86-12413 03-31)
Avail: NTIS HC A09/MF A01

N86-12466# Joint Publications Research Service, Arlington, Va.
APPLICATION OF RADIOGRAPHIC IMAGE ENHANCEMENT, SEGMENTATION
Wang Chengye and Xia Wei *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-032) 19 Sep. 1985 p 67-70 Transl. into ENGLISH from Jisuanji Yanjiu yu Fazhan (Beijing), v. 21, no. 12, Dec. 1984 p 52-53 (For primary document see N86-12462 03-31)
Avail: NTIS HC A08/MF A01

N86-12691# Joint Publications Research Service, Arlington, Va.
IONIC MECHANICSM OF EXCHANGE OF ADMIXTURES BETWEEN HYDROSPHERE AND ATMOSPHERE Abstract Only
A. V. Savchenko and V. V. Smirnov *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 74 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atm. i Okeana (Moscow), v. 21, no. 1, Jan. 1985 p 32-41 Original language document was announced in IAA as A85-26294 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

N86-12705# Joint Publications Research Service, Arlington, Va.
REMOTE DIAGNOSIS OF MEDIA BY COMBINATION (RAMAN) ANTI-STOKES LIGHT SCATTERING METHOD WITH INDUCED BRILLOUIN BACKSCATTERING Abstract Only
A. F. Bunkin, D. V. Vlasov, and A. S. Galumyan *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-008) 16 Aug. 1985 p 10-11 Transl. into ENGLISH from Kvantovaya Elektron. (Moscow), v. 12, no. 3, Mar. 1985 p 619-621 (For primary document see N86-12697 03-42)
Avail: NTIS HC A04/MF A01

75 PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion.

For ionospheric plasmas see *46 Geophysics*. For space plasmas see *90 Astrophysics*.

N86-13138*# Alabama Univ., Huntsville. School of Science.
PLASMA AND MAGNETOSPHERIC RESEARCH Quarterly Progress Report, Jul. - Sep. 1985
Richard H. Comfort and James L. Horwitz Oct. 1985 12 p refs (Contract NAS8-33982)

(NASA-CR-176326; NAS 1.26:176326) Avail: NTIS HC A02/MF A01 CSCL 20I

Several programs and variations have been developed to determine statistical means of different plasma parameters when binned in different variables. These parameters include temperature, densities and spacecraft potentials for any of the ion species, as well as ratios of these variables for any other ion species to the corresponding variable for H(+). The variables for binning include L, radial distance, and geomagnetic latitude; and separate statistics are automatically run for local morning and local evening data. These programs all run from output files from the plasma parameter thin sheath analysis program. A variant program also bins for magnetic activity, using either Kp or Dst, which requires an additional magnetic activity input file. These programs can be run either interactively or in batch mode, using file listings generated by a DIRECTORY command. In addition to printed output, these programs generate output files which can be used to plot the results. Programs to plot these averaged data are under development. Author

N86-13139# Air Force Geophysics Lab., Hanscom AFB, Mass.
CALCULATION OF THRESHOLD CONDITIONS FOR MATERIALS CHARGING IN MAXWELLIAN PLASMAS Interim Report
A. G. Rubin and M. Tautz 25 Jan. 1985 18 p
(AF Proj. 7661)
(AD-A157123; AFGL-TR-85-0020; AFGL-ERP-907) Avail: NTIS HC A02/MF A01 CSCL 20/9

Space Plasmas at geosynchronous orbit are usually not characterized by a single Maxwellian distribution function. Plasmas are characterized as single Maxwellians to first order and as a sum of two Maxwellians as a better approximation. A threshold electron temperature condition for charging of materials in the single Maxwellian is derived. Conditions for materials charging in the dual Maxwellian case are derived and illustrated. These are threefold: an initial negative current; a threshold electron temperature and a threshold electron current. GRA

N86-13140# Naval Research Lab., Washington, D. C.
BEHAVIOR OF IONIZED PLASMA IN THE HIGH LATITUDE TOPSIDE IONOSPHERE
S. G. Ganguli, H. G. Mitchell, Jr., and P. J. Palmadesso 27 Aug. 1985 40 p
(AD-A157930; NRL-MR-5623) Avail: NTIS HC A03/MF A01 CSCL 04/1

We have developed a numerical model to study the steady state behavior of a fully ionized plasma (H+, O+ and the electrons) encompassing the geomagnetic field lines. The theoretical formulation is based on the 16-moment system of transport equations. The electron gas collision is dominated below 2500 km. Above this altitude electron temperature anisotropy develops with temperature perpendicular to the field line being higher than that parallel to the field line. The H+ ion temperature anisotropy shows H+ temperature parallel to the field line being higher than that perpendicular to the field line. H+ ion temperature also exhibits adiabatic cooling as to the supersonic ion gas cools down as it expands in a diverging magnetic field. Our results are in good agreement with the previous theoretical studies of the polar wind and recent experimental observations. This is the first successful steady state solution to the 16-moment set of transport equations. GRA

N86-13141# Los Alamos National Lab., N. Mex.
FIELD-REVERSED CONFIGURATION FORMATION, TRANSLATION, AND CONFINEMENT STUDIES ON THE FRX-C/T EXPERIMENT
R. E. Siemon, W. T. Armstrong, R. E. Chrien, W. A. Hugrass, K. F. McKenna, D. J. Rej, and M. Tuszewski 1985 5 p Presented at the 12th European Conf. on Controlled Fusion and Plasma Phys., Budapest, 2 Sep. 1985
(Contract W-7405-eng-36)
(DE85-014095; LA-UR-85-2174; CONF-850927-2) Avail: NTIS HC A02/MF A01

The field-reversed configuration (FRC) is a high (BETA) (> 50%), prolate compact toroid plasma contained primarily by poloidal magnetic fields. FRC plasmas with parameters, anti n = 1-5 x 10 to the 15th power/cu cm., T/sub i/ = 0.1-0.8 keV, T/sub e/ = 0.1-0.2 keV, R approx. = 7 cm, B = 5-8 kG, lifetimes less than or equal to 300 (MU)s, are studied on the FRX-C/T experiment at Los Alamos. FRX-C/T consists of a 0.5-m-dia, 1.0-m-long field-reversed theta-pinch coil, and a 0.4-m-dia, 5-m-long translation region into which FRC's are launched, translated, and trapped. A 5-20 mtorr pressure D2 fill is introduced into the device by either a gas puff (localized in the theta-pinch source) or static fill system. DOE

N86-13142# Oak Ridge National Lab., Tenn.
TPSS PLASMA ENGINEERING STUDIES: PROFILE EFFECTS AND PLASMA POWER BALANCE
S. K. Borowski and D. J. Strickler 1985 12 p Presented at the TPSS Meeting, Atlanta, 15 May 1985
(Contract DE-AC05-84OR-21400)
(DE85-013638; CONF-8505175-1) Avail: NTIS HC A02/MF A01

A computationally fast profile-averaged, steady-state plasma model has been developed to allow studies of radial effects in ignited and driven tokamak systems. This code was used to search for the smallest size tokamak consistent with power balance calculation. DOE

N86-13143# Lawrence Livermore National Lab., Calif.
DIFFUSION IN BINARY PLASMA MIXTURES
D. B. Boercker, A. J. Ladd, and E. L. Pollock 16 Aug. 1985 15 p refs
(Contract W-7405-eng-48)
(DE85-017694; UCID-20507) Avail: NTIS HC A02/MF A01

Ion diffusion in binary plasma mixtures is considered. After first defining the diffusion coefficients for a binary mixture, it is shown how it is related to concentration fluctuations. The relation between diffusion and self diffusion is discussed. Specializing to a model of classical ions in a uniform, charge neutralizing, background molecular dynamics simulations and kinetic theory calculations are discussed. Results for H(+)-He(++) mixtures at a temperature of 5 eV and Si(+14)-Sr(+36) mixtures at 1 keV, all at 10 to the 22d power ions cu cm (3), are presented and discussed. DOE

N86-13144# Sandia National Labs., Albuquerque, N. Mex.
IMPLEMENTING THE AUTOMATED FEATURES OF THE PBFA-I CONTROL/MONITOR SYSTEMS
J. L. Spiller 1985 16 p Presented at the 5th IEEE Pulsed Power Conf., Washington, D.C., 10 Jun. 1985
(Contract DE-AC04-76DP-00789)
(DE85-012841; SAND-84-2537C; CONF-850616-29) Avail: NTIS HC A02/MF A01

A control system is being provided for PBFA-I, an operational accelerator, to control subsystem functions such as sequencing of oil, water, gas, and vacuum controls, to coordinate charging and firing sequences, and to control safe and idle modes of the machine. Important design concepts in automating this system are: reliability, flexibility, and operability. Reliability is a primary criterion for executing single pulsed power and physics experiments as well as for supporting extended experimental series without a failure that would cause downtime. Flexibility to respond to changes in operating parameters and experimenter needs is being implemented in two major areas: a modular I/O system to provide hardware flexibility, and structured software to ease software maintenance. Operability is increased with user friendly software, and automatic sequencing. DOE

N86-13145# Los Alamos Scientific Lab., N. Mex.
GENERALIZATION OF THE CHILD-LANGMUIR RELATION FOR ONE-DIMENSIONAL TIME-DEPENDENT DIODES
A. Kadish, W. Peter, and M. E. Jones 1985 4 p Presented at the Particle Accelerator Conf., Vancouver, British Columbia, 13 May 1985
(Contract W-7405-eng-36)
(DE85-012677; LA-74-85-1596; CONF-850504-102) Avail: NTIS HC A02/MF A01

The steady-state Child-Langmuir relation between current and applied voltage has been a basic principle upon which all modern diode physics has been based. With advances in pulsed power technology and diode design, new devices which operate in vastly different parameter regimes have recently become of interest. Many of these devices cannot be said to satisfy the strict requirements necessary for Child-Langmuir flow. For instance, in a recent pulsed electron device for use in high-current accelerators, the applied voltage is sinusoidal in time. In another case, development of sources for heavy ion fusion necessitates understanding of transient current oscillations when the voltage is applied abruptly. We derive the time-dependent relationship between the emitted current and time-dependent applied voltage in a nonrelativistic planar diode. The relationship is valid for arbitrary voltage shape V(t) applied to the diode for times less than the beam-front transit time across the gap. Using this relationship, transient and time-dependent effects in the start-up phase of any nonrelativistic diode can be analzyed. DOE

N86-13146# Stanford Linear Accelerator Center, Calif.
RF BEAM DEFLECTION MEASUREMENTS AND CORRECTIONS IN THE SLC LINAC
J. R. Seeman, M. C. Ross, J. C. Sheppard, and R. F. Stiening 13 May 1985 3 p refs Presented at the Particle Acelerator Conf., Vancouver, British Columbia, 13 May 1985
(Contract DE-AC03-76SF-00515)
(DE85-013061; SU-SLAC-Pub-3621; CONF-850504-111) Avail: NTIS HC A02/MF A01

The requirements of RF acceleration in the SLC linac to produce high energy beams are complicated by the presence of small transverse RF beam deflections which arise from several sources. These RF deflections place stringent tolerances on the phase and amplitude stability of the klystrons. They also force the use of special magnetic bumps to correct the trajectories of oppositely charged beams that will pass down the linac. If left unabated, RF deflections can limit the performance of the SLC. There are several methods to reduce the deflections. Many measurements of RF deflections have been made in the low energy part of the linac where the beams are most sensitive. DOE

N86-13147# Fermi National Accelerator Lab., Batavia, Ill.
DEPRIT'S ALGORITHM, GREEN'S FUNCTIONS AND MULTIPOLE PERTURBATION THEORY
L. Michelotti Apr. 1985 5 p refs Presented at the Orbital Dyn. and Appl. to Accelerators Workshop, Berkeley, Calif., 7 Mar. 1985
(Contract DE-AC02-76CH-03000)
(DE85-012297; FNAL/C-85/63; CONF-8503105-4) Avail: NTIS HC A02/MF A01

Within the context of accelerator multipole theory, we describe a method for solving Deprit's equations using a periodic Green's function. This procedure, implemented in a MACSYMA program, has been applied to a Hamiltonian with a normal sextupoles term, and the averaged or renormalized Hamiltonian has been calculated to fourth order in sextupole strength. Anticommutativity of the bracket algebra explains the observed slow growth in the number of induced resonances with order. DOE

N86-13148# Los Alamos Scientific Lab., N. Mex.
R-MATRIX ANALYSIS OF THE (7) Li SYSTEM WITH PERIPHERAL CHANNEL OVERLAP EXCHANGE EFFECTS
G. M. Hale 1985 5 p Presented at the Intern. Conf. on Nucl. Data for Basic and Appl. Sci., Santa Fe, N. Mex., 13 May 1985
(Contract W-7405-eng-36)
(DE85-012751; LA-UR-85-1961; CONF-850507-18) Avail: NTIS HC A02/MF A01

The parameters of an R-matrix analysis that include data for all reactions open in the (7)Li system at E sub x less than or equal to 10MeV suggest that deuteron exchange contributes to the low-energy (6)Li(n,t) reaction. A method for including this mechanism directly in the theory is discussed and preliminary results are given. DOE

N86-13149# Argonne National Lab., Ill.
COMPARISON BETWEEN THEORETICAL PREDICTIONS AND TRACKING
A. G. Ruggiero 1985 38 p refs Presented at the Orbital Dyn. and Appl. to Accelerators Workshop, Berkeley, Calif., 7 Mar. 1985
(Contract W-31-109-eng-38)
(DE85-012104; ANL-EEP-CP-85-27; CONF-8503105-3) Avail: NTIS HC A03/MF A01

The beam-beam interaction in a proton-antiproton collider has been an outstanding issue for a long time. Several theoretical predictions have been made in the past which range from the appearance of single beam-beam driven resonances to the onset of stochasticity and Arnold diffusion and the presence of chaotic trajectories. All these effects would cause a limit on the maximum strength of the beam-beam interactions, the so called beam-beam tune-shift, and speculative values have been offered ranging from as low as 0.0005 to as large as a fraction of unit. The lower limit could be caused in a more complicated situation where the external focussing forces which keep the two beams in the same storage ring are also modulated in time. These theoretical predictions have been compared with extensive computer tracking where the motion of the particles is followed turn after turn over very long periods of time. Though it is indeed possible to observe the formation of several resonances, nevertheless the onset of connected stochasticity seems to occur at too large beam-beam tune-shift to be of any practical relevance. Moreover no Arnold diffusion has been observed to have any practical significance. Chaotic trajectories have been found to embed the phase space in disconnected regions of appreciable extension. They increase in numbers considerably when time modulation of external focussing forces is added. DOE

N86-13150# KMS Fusion, Inc., Ann Arbor, Mich.
ABSOLUTELY UNSTABLE TWO-PLASMON DECAY IN TWO DIMENSIONS
L. V. Powers Feb. 1985 15 p
(Contract DE-AC08-82DP-40152)
(DE85-008157; DOE/DP-40152/T7; KMSF-U-1567) Avail: NTIS HC A02/MF A01

The purpose of the work reported herein is to examine absolute modes of the TPD instability in two dimensions in an infinite homogeneous plasma. Briggs has shown that the condition for absolute instability in this case is the existence of a solution of the coupled mode dispersion relation. Analytic solutions for eigenmodes in inhomogeneous plasma have been obtained as expansions about the solutions which satisfy the Briggs criteria in one dimension; hence finding TPD solutions which satisfy the Briggs criteria in two dimensions may give a basis for identifying two-dimensional eigenvalues in the inhomogeneous case as well. DOE

N86-13151# Stanford Linear Accelerator Center, Calif.
MINIMIZING THE ENERGY SPREAD WITHIN A SINGLE BUNCH BY SHAPING ITS CHARGE DISTRIBUTION
G. A. Loew and J. W. Wang Mar. 1985 3 p refs Presented at the Particle Accelerator Conf., Vancouver, British Columbia, 13 May 1985
(Contract DE-AC03-76SF-00515)
(DE85-013064; SU-SLAC-Pub-3598; CONF-850504-126) Avail: NTIS HC A02/MF A01

It has been known for some time that partial compensation of the longitudinal wake field effects can be obtained for any bunch by placing it ahead of the accelerating crest (in space), thereby letting the positive rising sinusoidal field offset the negative beam loading field. The work presented in this paper shows that it is possible to obtain complete compensation, i.e., to reduce the energy spread essentially to zero by properly shaping the longitudinal charge distribution of the bunch and by placing it at the correct position on the wave. DOE

N86-13152# Los Alamos National Lab., N. Mex.
FRC FORMATION STUDIES WITH Z-DISCHARGE IONIZATION ON FRX-C
W. T. Armstrong, R. E. Chrien, W. A. Hugrass, P. L. Klingner, K.

F. McKenna, R. D. Milroy, D. J. Rej, E. G. Sherwood, R. E. Siemon, and M. Tuszewski 1985 6 p Presented at the 7th US Symp. on Compact Toroid Res., Santa Fe, N. Mex., 21 May 1985 Prepared in cooperation with Spectra Technology, Inc., Bellevue, Wash.
(Contract W-7405-eng-36)
(DE85-012765; LA-UR-85-1834; CONF-8505100-9) Avail: NTIS HC A02/MF A01

Recent exploratory operation at high bias levels on FRX-C is discussed. The motivation of these in situ formation studies was to explore the use of Z-discharge ionization (Z-PI) for achieving larger trapped poloidal flux and commensurately large x/sub s/ values, where x/sub s/ is the ratio of the separatrix radius r/sub s/ to the coil radius r/sub c/. Such studies are of interest in ascertaining predicted improvements of particle confinement and degradation of stability with the associated increase of anti s, the approximate number of ion gyroradii across the minor radius of the FRC. The results of these studies may be summarized briefly as: (1) the Z-PI worked well in conjunction with conventional theta-PI to extend the level of trapped flux at high fill pressure (20 mtorr), but the Z-PI worked poorly at low fill pressure (5 mtorr), and (2) increased trapped flux at 5 mtorr quickly led to degradation of the flux lifetime and no significant increase in x/sub s/, while at 20 mtorr the initial value of x/sub s/ was increased significantly but with degraded flux lifetimes. DOE

N86-13153# Stanford Linear Accelerator Center, Calif.
SLC INJECTOR MODELING
H. Hanerfeld, W. B. Herramannsfeldt, M. B. James, and R. H. Miller Mar. 1985 4 p Presented at the Particle Accelerator Conf., Vancouver, British Columbia, 13 May 1985
(Contract DE-AC03-76SF-00515)
(DE85-013067; SU-SLAC-Pub-3614; CONF-850504-123) Avail: NTIS HC A02/MF A01

The injector for the Stanford Linear Collider is being studied using the fully electromagnetic particle-in-cell program MASK. The program takes account of cylindrically symmetrical RF fields from the external source, as well as fields produced by the beam and dc magnetic fields. It calculates the radial and longitudinal motion of electrons and plots their positions in various planes in phase space. Bunching parameters can be optimized and insights into the bunching process and emittance growth have been gained. The results of the simulations are compared to the experimental results. DOE

N86-13154# Oak Ridge National Lab., Tenn.
SUBMILLIMETER WAVE PROPAGATION IN TOKAMAK PLASMAS
C. H. Ma, D. P. Hutchinson, P. A. Staats, K. L. VanderSluis, D. K. Mansfield, H. Park, and I. C. Johnson 1985 6 p Presented at the Intern. Symp. on Antennas and Propagation, Kyoto, 20 Aug. 1985 Prepared in cooperation with Princeton Univ., N.J.
(Contracts DE-AC02-76CH-03073; DE-AC05-84OR-21400)
(DE85-007747; CONF-850839-1) Avail: NTIS HC A02/MF A01

The propagation of submillimeter-waves (smm) in tokamak plasmas has been investigated both theoretically and experimentally to ensure successful measurements of electron density and plasma current distributions in tokamak devices. Theoretical analyses have been carried out to study the polarization of the smm waves in TFTR and ISX-B tokamaks. A multichord smm wave interferometer/polarimeter system has been employed to simultaneously measure the line electron density and poloidal field-induced Faraday rotation in the ISX-B tokamak. The experimental study of TFTR is under way. Computer codes have been developed and have been used to study the wave propagation and to reconstruct the distributions of plasma current and density from the measured data. The results are compared with other measurements. DOE

N86-13155# Brookhaven National Lab., Upton, N. Y.
FULLY STRIPPED HEAVY ION YIELD VS ENERGY FOR Xe AND Au IONS
P. Thieberger, H. E. Wegner, J. Alonzo, H. Gould, R. E. Anholt, and W. E. Meyerhof 1985 4 p refs Presented at the Particle Accelerator Conf., Vancouver, British Columbia, 13 May 1985
(DE85-013281; BNL-36555; CONF-850504-156) Avail: NTIS HC A02/MF A02

The Bevalac is now capable of accelerating U-238 ions to approximately 1 GeV/amu and measurements have shown that fully stripped U-238 ions are produced with good yield at these energies. However, knowing the stripping yields at different energies for U-238 does not allow an accurate prediction for other, lower Z projectiles. Consequently, extensive stripping yield measurements were made for Au-197 and Xe-139 ions. In addition to the stripping measurements from the direct Bevalac beam, pickup measurements were also made with specially prepared bare, one electron, and two electron ions. Since many research groups are considering heavy ion storage rings and/or synchrotrons, the pickup cross section for bare ions is important to estimate beam lifetime in terms of the average machine vacuum. Since the Mylar target provides a pickup probability similar to air, a preliminary analysis of the Xe(54+) and U(92+) data are presented along with predictions for other ions ranging down to Fe(26+). DOE

N86-13156# Brookhaven National Lab., Upton, N. Y.
TRACKING STUDIES ON THE EFFECTS OF RANDOM MULTIPOLES IN THE 6.5 T LATTICE OF THE SSC REFERENCE DESIGNS STUDY
G. F. Dell 1985 4 p Presented at the Particle Acclerator Conf., Vancouver, British Columbia, 13 May 1985
(Contract DE-AC02-76CH-00016)
(DE85-013286; BNL-36567; CONF-850504-158) Avail: NTIS HC A02/MF A01

The acceptance of lattice A (6.5 T) of the SSC Reference Designs Study is determined for ten different sets of random errors as various multipole orders are set to zero. On the basis of 400 turn studies it is concluded that all multipole orders in the dipoles are important. Further studies show that the beam crossing dipoles limit the acceptance - when their multipoles are scaled as r(-)/sup (n+1)/, corresponding to an increased coil radius, the acceptance of the lattice essentially doubles. DOE

N86-13157# Brookhaven National Lab., Upton, N. Y.
LARGE ACCEPTANCE MAGNETIC FOCUSSING HORNS FOR PRODUCTION OF A HIGH INTENSITY NARROW BAND NEUTRINO BEAM AT THE AGS
A. Carroll, I. Chimienti, W. Leonhardt, R. Monaghan, G. Ryan, J. Sandberg, W. Sims, G. Smith, P. Stillman, and H. Thorwarth 1985 4 p Prepared in cooperation with Columbia Univ., N.Y.
(Contract DE-AC02-76CH-00016)
(DE85-013300; BNL-36491; CONF-850504-148) Avail: NTIS HC A02/MF A01

A set of two large acceptance (20 to 140 mrad) horns have been designed and built to form a parallel beam of 3 GeV/c pions and kaons for the production of an intense, dichromatic neutrino beam. A set of beam plugs and collimators determined the momentum of the particles which pass through the horns. The ooling and maintenance of the horns and target was a particular concern since they were operated with an incident intensity of over 10(13) proton/sec. These systems were designed for simplicity, reliability, and easy replacement. DOE

N86-13158# New York Univ., New York. Inst. of Mathematical Sciences.
WAVE PROPAGATION IN A PLASMA BASED ON THE COLD PLASMA MODEL
H. Weitzner Aug. 1985 51 p
(Contract DE-AC02-76ER-03077)
(DE85-013649; DOE/ER-03077/225) Avail: NTIS HC A04/MF A01

The cold plasma conductivity tensor is employed to explore the problem of wave propagation in a plasma without the use of the geometrical optics approximation or a plane stratified model. After the introduction of the appropriate electromagnetic potentials, the wave propagation problem reduces to a sixth order self-adjoint set of partial differential equations derivable from a self-adjoint variation principle. The usual lower and upper hybrid resonances

as well as the plasma resonances can be identified as surfaces across which the system of equations changes from elliptic to partially elliptic and partially hyperbolic. In addition, the ion and electron cyclotron resonance surfaces, near which the cold plasma approximation breaks down, are also transition surfaces. DOE

N86-13159# Stanford Linear Accelerator Center, Calif.
COMMISSIONING AND OPERATION OF THE NUCLEAR PHYSICS INJECTOR AT SLAC
R. F. Koontz, R. H. Miller, G. K. Leger, and R. Iverson Mar. 1985 4 p Presented at the Particle Accelerator Conf., Vancouver, British Columbia, 13 May 195
(Contract DE-AC03-76SF-00515)
(DE85-013374; SU-SLAC-Pub-3615; CONF-850504-68) Avail: NTIS HC A02/MF A01

The new Nuclear Physics Injector (NPI) approved for construction in October of 1983 was completed by September of 1984, and delivered short pulse beams for SPEAR ring checkout in mid-October. Long pulse beams of up to 1.6 microsecond length were also demonstrated. The paper describes the startup operation, reviews the performance characteristics, and discusses the beam transport optics used to deliver 1 to 4 GeV beams to nuclear physics experiments in End Station A. DOE

N86-13160# Lawrence Livermore National Lab., Calif.
CONVERSION OF THE BOUNCE-AVERAGED FOKKER-PLANCK CODE TO CONVERSION FORM
T. D. Rognlien 1 Jul. 1985 16 p
(Contract W-7405-eng-48)
(DE85-014861; UCID-20474) Avail: NTIS HC A02/MF A01

This report describes a major modification to the bounce-averaged Fokker-Planck code of Cutler, et al. The new version of the code is written in conservation form which results in the line density being conserved exactly except at phase space boundaries. The notation and procedure for writing the code in conservation form closely follows the work of Mirin on the square well code Hybrid II, and Kerbel and McCoy on their bounce-average code CQL. Much of the original code has been perserved, and the input is the same as before; old input files should run on the new version. The major modifications to the code have occurred in subroutines COFF, IADVANCE, and RFTERMS. A new subroutine, FLUX, has been added to compute the flux across loss boundaries. DOE

N86-13161# Rochester Univ., N. Y. Lab. for Laser Energetics.
ABSORPTION AND HOT ELECTRON GENERATION IN uv (351 nm) DRIVEN SPHERICAL IMPLODING TARGETS
R. L. Keck, M. C. Richardson, J. M. Soures, and J. Delletrez 1984 7 p Presented at the Meeting of the Plasma Phys. Div. of the Am. Phys. Soc., Boston, 27 Oct. 1984
(Contract DE-AC08-80EP-40124)
(DE85-014405; DOE/DP-40124/53; CONF-841010-21) Avail: NTIS HC A02/MF A01

The advantages of short wave-length radiation for laser fusion in terms of laser absorption and low levels of suprathermal electron preheat are well known. Recently, these have been characterized for 6 beam 351 nm irradiation on solid spherical targets. In this report, we extend these studies to imploding shell targets driven by 6 or 12 beams from the OMEGA laser system. With these targets, the critical density surface is expected to move toward the target center during the laser pulse, reducing the absorption. The measurements will be compared to the predictions of hydrodynamic code calculations. DOE

N86-13162# Rochester Univ., N. Y. Lab. for Laser Energetics.
SPATIAL STRUCTURE OF HEAT FLOW INSTABILITIES IN LASER PLASMAS
R. W. Short 1984 16 p Presented at the Meeting of the Plasma Phys. Div. of the Am. Phys. Soc., Boston, 27 Oct. 1984
(Contract DE-AC08-80DP-40124)
(DE85-014407; DOE/EP-40124/57; CONF-841010-20) Avail: NTIS HC A02/MF A01

The steep temperature gradients characteristic of laser-produced plasmas generate strong thermal fluxes which can be unstable. Previous theoretical investigations of these instabilities have found temporal growth rates for modes which are uniform in the direction of heat flow. Here the analysis is extended to modes with spatial dependence in this direction. Spatial growth rates and the conditions for which the instability is absolute are determined, and the consequences for thermal transport and smoothing are discussed. DOE

N86-13163# Lawrence Livermore National Lab., Calif.
MULTIVARIABLE CURRENT CONTROL FOR ELECTRICALLY AND MAGNETICALLY COUPLED SUPERCONDUCTING MAGNETS
E. W. Owen and D. W. Shimer 8 Feb. 1985 7 p Presented at the 6th Topical Meeting on the Technol. of Fusion Energy, San Francisco, 3 Mar. 1985
(Contract W-7405-eng-48)
(DE85-012941; UCRL-92092; CONF-850310-113) Avail: NTIS HC A02/MF A01

Superconducting magnet systems under construction and projected for the future contain magnets that are magnetically coupled and electrically connected with shared power supplies. A change in one power supply voltage affects all of the magnet currents. A current controller for these systems must be designed as a multivariable system. The paper describes a method, based on decoupling control, for the rational design of these systems. Dynamic decoupling is achieved by cross feedback of the measured currents. A network of gains at the input decouples the system statically and eliminates the steady state error. Errors are then due to component variations. The method has been applied to the magnet system of the MFTF-B, at the Lawrence Livermore National Laboratory. DOE

N86-13164# Lawrence Livermore National Lab., Calif.
HIGH EFFICIENCY ICF DRIVER EMPLOYING MAGNETICALLY CONFINED PLASMA RINGS
D. J. Meeker, J. H. Hammer, and C. W. Hartman 4 Mar. 1985 8 p Presented at the 6th Topical Meeting on the Technol. of Fusion Energy, San Francisco, 3 Mar. 1985
(Contract W-7405-eng-48)
(DE85-012939; UCRL-91693; CONF-850310-114) Avail: NTIS HC A02/MF A01

We discuss the possibility of achieving energy, power and power density necessary for ICF by magnetically accelerating plasma confined by a compact torus (CT) field configuration. The CT, which consists of a dipole (poloidal) field and imbedded toroidal field formed by force free, plasma current, is compressed and accelerated between coaxial electrodes by B/sub THETA/ fields as in a coaxial railgun. Compression and acceleration over several meters by a 9.4 MJ capacitor bank is predicted to give a 5.7 cm radius, 0.001 gm CT 5 MJ kinetic energy (10(7) m/sec). Transport and focussing several meters by a disposable lithium pipe across the containment vessel is predicted to bring 4.8 MJ into the pellet region in 0.5 cm(2) area in 0.3 ns. The high efficiency (approx. 50%) and high energy delivery of the CT accelerator could lead to low cost, few hundred MW power plants that are economically viable. DOE

N86-13165# Wisconsin Univ., Madison.
MULTIPOLE AND TOKAMAK RESEARCH AT THE UNIVERSITY OF WISCONSIN
J. C. Sprott and S. C. Prager May 1985 12 p
(Contract DE-AC02-76ET-53051)
(DE85-014862; DOE/ET-53051/83) Avail: NTIS HC A02/MF A01

Experimental axisymmetric toroidal confinement research has been pursued at the University of Wisconsin through the utilization of multipole and tokamak devices. Multipoles facilitated the controlled study of key confinement issues since in a single device one is able to vary, over a wide range, critical plasma parameters including ohmic current level, collisionality, field transform, magnetic shear and plasma beta. This feature, and the natural quiescence

of multipole plasmas, has been exploited for over twenty years at Wisconsin through a sequence of different multipole devices culminating in the Levitated Toroidal Octupole. Important aspects of toroidal plasma equilibrium, stability, heating and transport have been studied which often could not be addressed in existing tokamak. Toroidal confinement research using the Tokapole II poloidal divertor tokamak began in 1977, with emphasis on issues relating to the magnetic limiter topology. DOE

N86-13166# Oak Ridge National Lab., Tenn.
SPECTRAL METHOD FOR OBTAINING THREE-DIMENSIONAL MAGNETOHYDRODYNAMIC EQUILIBRIA
S. P. Hirshman and D. K. Lee Jul. 1985 35 p
(Contract DE-AC05-84OR-21400)
(DE85-015065; ORNL/TM-9531) Avail: NTIS HC A03/MF A01

A description is given of a new code, MOMCON (spectral moments with constraints), that obtains three-dimensional ideal magnetohydrodynamic (MHD) equilibria in a fixed toroidal domain using a Fourier expansion for the inverse coordinates (R,Z) representing nested magnetic surfaces. A set of nonlinear coupled ordinary differential equations for the spectral coefficients of (R,Z) is solved using an accelerated steepest descent method. A stream function lambda is introduced to improve the mode convergence properties of the Fourier series for R and Z. Constraint equations relating the m greater than or equal to 2 moments of R and Z are solved to define a unique poloidal angle. DOE

N86-13167# Los Alamos Scientific Lab., N. Mex.
PLANE-WAVE THEORY OF ELECTRICAL TRANSPORT IN DISORDERED SYSTEMS
G. Rinker May 1985 20 p
(Contract W-7405-eng-36)
(DE85-015353; LA-10404-MS) Avail: NTIS HC A02/MF A01

This is the third in a series of reports concerning the electrical and thermal transport properties of dense plasma. In the present work we construct a plane-wave theory that approximates, with moderate success, our previous partial-wave calculations of electrical and thermal transport coefficients. Regions of validity are indicated. Comparisons are made with experimental measurements of source libraries that contain the transport coefficients calculated by the present method for all elements from $Z = 1$ to $Z = 96$. DOE

N86-13168# Brookhaven National Lab., Upton, N. Y.
MAGNET POWER SUPPLY CONTROL OF THE NSLS VUV AND X-RAY STORAGE RINGS TRANSFER LINES
J. D. Klein, S. Ramamoorthy, O. Singh, and J. D. Smith 1985 4 p Presented at the Particle Accelerator Conf., Vancouver, British Columbia, 13 May 1985
(Contract DE-AC02-76CH-00016)
(DE85-014213; BNL-36504; CONF-850504-196) Avail: NTIS HC A02/MF A01

The transfer lines for NSLS VUV and X-ray storage rings have been split. New power supplies have been incorporated with existing cones. The existing microprocessor system has been upgraded in order to control the additional functions. This system expands the input/output port of the microprocessor to an addressable serial/parallel link to each magnet power supply. The implementation of this system will be discussed. DOE

N86-13169# Stanford Linear Accelerator Center, Calif.
REAL TIME BUNCH LENGTH MEASUREMENTS IN THE SLC LINAC
J. C. Sheppard, J. E. Clendenin, M. B. James, R. H. Miller, and M. C. Ross Feb. 1985 4 p refs Presented at the Particle Accelerator Conf., Vancouver, British Columbia, 13 May 1985
(Contract DE-AC03-76SF-00515)
(DE85-014362; SU-SLAC-Pub-3584; CONF-850504-205) Avail: NTIS HC A02/MF A01

The longitudinal charge distribution of bunches accelerated in the Stanford Linear Collider (SLC) linac will strongly affect the performance of the Collider. Bunch lengths are chosen in a balance between the deleterious effects of longitudinal and transverse wakefields. The former impacts on the beam energy spread whereas the latter is important to the transverse emittance. Two bunch length measurement ports have been installed in the SLC linac: one in the injector region and one after the emittance damping ring to linac reinjection point. These ports utilize a fused quartz Cerenkov radiator in conjunction with an electrooptic streak camera to permit real time monitoring of single s-band buckets with a resolution of several picoseconds. The design of the radiators and light collection optics is discussed with an emphasis on those issues important to high resolution. Experimental results are presented. DOE

N86-13170# Massachusetts Inst. of Tech., Cambridge. Plasma Fusion Center.
THEORY OF THE ANOMALOUS DOPPLER INSTABILITY DURING LOWER-HYBRID CURRENT DRIVE
S. C. Luckhardt 1985 13 p Presented at the 6th Topical Conf. on Radio Frequency Plasma Heating, Pine Mountain, Ga., 13 May 1985
(Contract DE-AC08-78ET-51013)
(DE85-014064; DOE/ET-51013/149; PFC/CP-85-3; CONF-8505130-8) Avail: NTIS HC A02/MF A01

An instability condition is derived for electrostatic waves obeying the dispersion relation (LC OMEGA) = (LC OMEGA)/sub pe/k/sub parallel// k using a two dimensional electron distribution function, f(v/sub parallel/, v/sub< perpendicular/), appropriate for lower-hybrid current drive. It is found that when the raised plateau in f in the velocity range v1<v/sub parallel <v2 has a sufficiently large anisotropy, T/sub p parallel/ <T/sub p perpendicular/, this mode can become unstable. If the plateau velocities satisfy the condition v2/v1> 1 + (LC OMEGA)/sub ce// (LC MEGA) /sub cee//LC OMEGA)/sub pe/ then waves exist with phase velocities in the plateau region and these waves are most easily destabilized by the anomalous Doppler resonance, (LC OMEGA) - k/sub parallel/v/sub parallel/ = (LC OMEGA)/sub ce/. DOE

N86-13171# Texas Univ., Austin. Inst. for Fusion Studies.
SOLITARY VORTICES IN A ROTATING PLASMA
W. Horton, J. Liu, J. D. Meiss, and J. E. Sedlak May 1985 32 p
(Contract DE-FG05-80ET-53088)
(DE85-014766; DOE/ET-53088/193; IFSR-193) Avail: NTIS HC A03/MF A01

Nonlinear equations describing the flute dynamics of rotating plasma are derived and solitary vortex solutions are obtained. The solution takes the form of a shielded dipole vortex, similar to that found for nonlinear Rossby waves. The nonlinear dispersion relation, relating propagation speed to vortex radius is obtained. Vortex speeds are shown to take values complementary to the phase velocities of the linear modes of the system. The E x B circulation velocity of the plasma trapped in the vortex is comparable to the diamagnetic drift velocity in the equilibrium plasma. DOE

N86-13172# Texas Univ., Austin. Inst. for Fusion Studies.
EXPLOSIVE COALESCENCE OF MAGNETIC ISLANDS
T. Tajima and J. I. Sakai Apr. 1985 14 p
(Contract DE-FG05-80FT-53088)
(DE85-015083; DOE/ET-53088/186; IFSR-186) Avail: NTIS HC A02/MF A01

An explosive reconnection process associated with nonlinear evolution of the coalescence instability is found through studies of particle and magnetohydrodynamic simulations. The explosive coalescence is a self-similar process of magnetic collapse, in which the magnetic and electrostatic energies and temperatures explode toward the explosion time t0 as (t0-t) sup 8/3, (t0-t) (-4), and (t0-t)/sup -8/3, respectively. Ensuing amplitude oscillations in these quantities are identified by deriving an equation of motion for the scale factor in the Sagdeev potential. DOE

N86-13173# Los Alamos Scientific Lab., N. Mex.
WNR/PSR FACILITY: NEUTRON PHYSICS CAPABILITIES FROM SUB-THERMAL TO 800 MeV
P. W. Lisowski, S. A. Wender, and G. F. Auchampaugh 1985

14 p refs Presented at the Intern. Conf. on Nucl. Data for Basic and Appl. Sci., Santa Fe, N. Mex., 13 May 1985
(Contract W-7405-eng-36)
(DE85-014072; LA-UR-85-2272; CONF-850507-45) Avail: NTIS HC A02/MF A01

The Weapons Neutron Research facility (WNR) is a versatile pulsed neutron source used in a variety of research programs ranging from fundamental neutron properties with ultra cold neutrons to medium energy charge exchange reaction studies. Here we describe the WNR facility and the improvements presently in progress as the Proton Storage Ring (PSR) becomes operational. DOE

N86-13174# California Univ., Berkeley. Lawrence Berkeley Lab.
ELECTRON-SPIN-POLARIZED TARGETS FOR A COLLISIONALLY-PUMPED POLARIZED-ION SOURCE
S. N. Kaplan, C. F. Burrell, R. V. Pyle, L. Ruby, A. S. Schlacheter, and J. W. Stearns May 1985 6 p refs Presented at Particle Accelerator Conf., Vancouver, British Columbia, 13 May 1985
(Contract DE-AC03-76SF-00098)
(DE85-015276; LBL-19011; CONF-850504-227) Avail: NTIS HC A02/MF A01

Collisional pumping has been proposed as a mechanism for producing polarized ion beams more intense by orders of magnitude than those from the best existing sources. One implementation of this method employs a very thick electron-spin-polarized alkali-vapor target in a low magnetic field, and is characterized by a predicted 100% spin-transfer efficiency from the target to the beam. Target characteristics and design constraints are discussed. DOE

N86-13175# Rochester Univ., N. Y. Lab. for Laser Energetics.
ABSORPTION SPECTROSCOPY AS A DENSITY DIAGNOSTIC FOR DENSE IMPLODED SHELLS
R. Epstein, S. Skupsky, and B. Yaakobi 1985 16 p Presented at the 5th Topical Conf. on Atomic Processes in High Temp. Plasmas, Pacific Grove, Calif., 25 Feb. 1985
(Contract DE-AC08-80DP-40124)
(DE85-014413; DOE/DP-40124/72; CONF-850238-1) Avail: NTIS HC A02/MF A01

Absorption lines of tamper layer additives may serve as diagnostics of the shell areal density (rhoR) and thus of the core compression in high compression target implosion experiments. The range of implosion conditions for which this technique would be applicable is investigated. Nou-LTE simulations of absorption spectra are presented to illustrate cases of interest. DOE

N86-13176# California Univ., Berkeley. Lawrence Berkeley Lab.
COMPACT MICROWAVE ION SOURCE
K. N. Leung, S. Walther, and H. W. Owren May 1985 5 p refs Presented at Particle Accelerator Conf., Vancouver, British Columbia, 13 May 1985
(Contract DE-AC03-76SF-00098)
(DE85-014536; LBL-18985; CONF-850504-206) Avail: NTIS HC A02/MF A01

A small microwave ion source has been fabricated from a quartz tube with one end enclosed by a two grid accelerator. The source is also enclosed by a cavity operated at a frequency of 2.45 GHz. Microwave power as high as 500 W can be coupled to the source plasma. The source has been operated with and without multicusp fields for different gases. In the case of hydrogen, ion current density of 200 mA/sq.cm with atomic ion species concentration as high as 80% has been extracted from the source. DOE

N86-13177# Los Alamos Scientific Lab., N. Mex.
RECENT RESULTS OF AN INTERNAL TILT MODE CALCULATION IN FRCS
D. C. Barnes, J. L. Schwarzmeier, and H. R. Lewis 1985 6 p refs Presented at 7th US Symp. on Compact Toroidal Res., Santa Fe, N. Mex., 21 May 1985
(Contract W-7405-eng-36)
(DE85-014121; LA-UR-85-2040; CONF-8505100-16) Avail: NTIS HC A02/MF A01

Recent theoretical results on the stability of FRCs to the internal tilt mode are presented. An approximate treatment of collisions shows that collisions have a small effect on the growth rate of the mode until the plasma becomes very collisional (lambda/sub ii/ less than or equal to r/sub s/2). Finite Larmor radius theory predicts that the growth rate of the instability normalized to that of MHD depends only on the combination anti s/e, where e is the plasma elongation. However, a full Vlasov stability calculation does not appear to show such a scaling. DOE

N86-13178# Sandia National Labs., Albuquerque, N. Mex.
LASER DIAGNOSTIC STUDIES OF PLASMA ETCHING AND DEPOSITION
P. J. Hargis, Jr., R. W. Light, and J. M. Gee 1985 7 p refs Presented at the Intern. Conf. on Laser Process. and Diagn. Appl. in Electron. Mater., Linz, Austria, 15 Jul. 1984
(Contract DE-AC04-76DP-00789)
(DE85-009494; SAND-85-0082C; CONF-840761-2) Avail: NTIS HC A02/MF A01

Laser excited fluorescence spectroscopy was used to determine that CF2 radicals control the silicon dioxide to silicon etch-rate ratio in fluorocarbon discharges used to etch silicon and silicon dioxide. CF2 was found to control the etch-rate ratio through polymer formation which selectively inhibits the silicon etch rate. DOE

N86-13179# Wisconsin Univ., Madison.
ALFVEN WAVE HEATING ON TOKAPOLE 2
D. Korthawi and O. Eldridge May 1985 6 p Presented at the 6th Topical Conf. on Radio Frequency Plasma Heating, Pine Mountain, Ga., 13 May 1985
(Contract DE-AC02-76ET-53051)
(DE85-014859; DOE/ET-53051/84; CONF-8505130-10) Avail: NTIS HC A02/MF A01

Alfven wave experiments are being conducted on the Tokapole 2 tokamak, backed up by theoretical work. Several antenna designs are being tested. Earlier results with antennas carrying current in a primarily toroidal direction have shown significant loading with a strong dependence on the angle of the currents w.r.t. the equilibrium field. In such cases magnetic probes detect strong signals in the scrape-off region, and there is little or no evidence of bulk heating despite P/sub RF/p/sub OHMIC approx. 30 to 50%. A new antenna design to allow launching with any polarization and upgraded diagnostics is being installed. The experimental antenna loading is compared to a slab model in the MHD limit, with given density and current profiles and zero pressure. The antenna is modeled by a single, thin folded strap in vacuum, with variable orientation. The effects of the far wall and of eigenmodes are removed by assuming that each Fourier component of the wave damps exponentially on the far side of the Alfven resonant surface. The calculated radiation resistance is in the milliohm range and varies slowly with antenna orientation. DOE

N86-13180# Rochester Univ., N. Y. Lab. for Laser Energetics.
NEW DIRECTIONS FOR SHORT-WAVELENGTH LASER FUSION AND HIGH-ENERGY-DENSITY PHYSICS
R. L. McCrory, J. M. Soures, L. M. Goldman, M. C. Richardson, W. D. Seka, A. Simon, S. Skupsky, C. P. Verdon, and B. Yaakobi Nov. 1984 46 p
(Contract DE-FC-08-85DP-40200)
(DE85-014414; DOE/DP-40200/6) Avail: NTIS HC A03/MF A01

New directions in inertial fusion research using short-wavelength, direct-drive targets have increased the prospects for demonstrating inertial fusion feasibility and have generated new interest and opportunities in high-energy-density research. DOE

N86-13181# Lawrence Livermore National Lab., Calif.
IDENTIFYING HEAVY-ION-BEAM FUSION DESIGN AND SYSTEM FEATURES WITH HIGH ECONOMIC LEVERAGE
W. R. Meier and W. J. Hogan 3 Mar. 1985 43 p
(Contract W-7405-eng-48)
(DE85-014849; UCID-20470) Avail: NTIS HC A03/MF A01

We have conducted parametric economic studies for heavy-ion-beam fusion electric power plants. We examined the effects on

the cost of electricity of several design parameters: maximum achievable chamber pulse rate, driver cost, target gain, and electric conversion efficiency, and net electric power. We found with reasonable assumptions on driver cost, target gain, and electric conversion efficiency, a 2 to 3 GWe heavy-ion-beam fusion power plant, with a chamber pulse rate of 5 to 10 Hz, can be competitive with nuclear and coal power plants. DOE

N86-13182# Brookhaven National Lab., Upton, N. Y.
AGS IMPROVEMENT PROGRAM
Y. Y. Lee 1985 3 p Presented at the Particle Accelerator Conf., Vancouver, British Columbia, 13 May 1985
(Contract DE-AC02-76CH-00016)
(DE85-013293; BNL-36484; CONF-850504-162) Avail: NTIS HC A02/MF A01

The interest of both particle and nuclear physicists are converging on the alternating gradient synchrotrons (AGS). This machine is almost ideally and uniquely suited to perform a new class of frontier experiments. Particle physicists would like to study the extremely heavy (multi-TeV) particles posited by new theories by searching for rare k-decays. Nuclear physicists want to create the extremely denser form of nuclear matter which exists within neutron stars by studying heavy ion collisions. The particle physicists require extremely intense proton beams in order to produce enough k's. The nuclear physicists require heavy ions accelerated in the top energies of the AGS. The AGS recently acquired a new capability of accelerating polarized protons to 16.5-GeV and will extend its energy to full energy of the machine. This new capability will open the way to extend the surprising lower energy result of spin-spin correlation of high momentum transfer collisions to much higher energy. DOE

N86-13183# National Bureau of Standards, Boulder, Colo. Fracture and Deformation Div.
MATERIALS STUDIES FOR MAGNETIC FUSION ENERGY APPLICATIONS AT LOW TEMPERATURES - 8
R. P. Reed May 1985 335 p Sponsored in part by DOE
(PB85-236362; NBSIR-85/3025-8) Avail: NTIS HC A15/MF A01 CSCL 18A

Results of a research program to produce material property data that will facilitate design and development of cryogenic structures for the superconducting magnets of magnetic fusion energy power plants and prototypes are presented. Research results for 1984 are summarized in an initial 'Highlights of Results' section and reported in detail in the technical papers that form the main body. The technical papers are presented under four headings reflecting the main program areas: Welding, Nonmetallics, Structural Alloys, and Technology Transfer. Objectives, approaches, and achievements are summarized in an introduction to each program area. GRA

N86-12447# Joint Publications Research Service, Arlington, Va.
PROGRESS OF INERTIAL CONFINEMENT RESEARCH DETAILED
Wang Ganchang *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-029) 3 Sep. 1985 p 1-17 refs Transl. into ENGLISH from He Kexue Yu Gongcheng (Beijing), v. 4, no. 4, Dec. 1984 p 289-302 (For primary document see N86-12446 03-31)
Avail: NTIS HC A08/MF A01

76 SOLID-STATE PHYSICS

Includes superconductivity.

For related information, see also *33 Electronics and Electrical Engineering* and *36 Lasers and Masers.*

N86-13184 Department of the Air Force, Washington, D.C.
ACOUSTICALLY TUNED OPTICAL FILTER SYSTEM Patent
V. Azgapetian and A. M. Azgapetian, inventors (to Air Force) Issued 30 Apr. 1985 4 p Supersedes AD-D010417
(AD-D011791; US-Patent-4,514,056; US-Patent-Appl-SN-439493; US-Patent-Class-350-372) Avail: US Patent and Trademark Office CSCL 20/6

Two crystals, made of acousto-optical material and having their respective extraordinary axes at a predetermined angle to each other, are acoustically excited; and, in combination with a polarizer and an analyzer, the acoustically excited crystals permit the complete transmission or rejection of a preselected narrow band of polarized light in the visible/infrared wavelength of the region. Author (GRA)

N86-13185 Department of the Navy, Washington, D. C.
RECOVERY OF FRAGILE LAYERS PRODUCED ON SUBSTRATES BY CHEMICAL VAPOR DEPOSITION Patent
A. Addamiano and P. H. Klein, inventors (to Navy) Issued 23 Apr. 1985 5 p Supersedes AD-D010378
(AD-D011841; US-Patent-4,512,825; US-Patent-Appl-SN-484346; US-Patent-Class-148-175) Avail: US Patent and Trademark Office CSCL 20/12

This patent pertains to a method of recovering intact at room temperature a layer of a first material, such as silicon carbide, produced by depositing it from the gas phase at a deposition temperature above room temperature on a substrate of a second material, such as silicon, having a different coefficient of thermal expansion than that of the first material. The substrate is separated from the layer prior to cooling, and then the separated layer is cooled to room temperature free of stresses otherwise present as a result of the different thermal expansions of the substrate and layer. The present invention relates generally to coating and more particularly to coating wherein a semiconductor product is produced. GRA

N86-13186 Department of the Navy, Washington, D. C.
METHOD FOR THE DEPOSITION OF HIGH-QUALITY CRYSTAL EPITAXIAL FILMS OF IRON Patent
R. Kaplan and N. Bottka, inventors (to Navy) Issued 2 Apr. 1985 5 p Supersedes AD-D010588
(AD-D011842; US-Patent-4,508,590; US-Patent-Appl-SN-532938) Avail: US Patent and Trademark Office CSCL 20/2

This patent pertains to a method for forming a single crystal epitaxial film of a selected metal on the surface of a substrate. The method includes the steps of positioning the substrate in an ultra high vacuum environment and exposing the substrate surface to a metalorganic vapor including ions of the selected metal while maintaining an ultra high vacuum environment. GRA

N86-13187*# Auburn Univ., Ala. Engineering Experiment Station.
DEVELOPMENT OF A RADIATION-HARD CMOS PROCESS Final Technical Report
W. L. Power 4 Aug. 1983 22 p refs
(Contract NAS8-33092)
(NASA-CR-170925; NAS 1.26:170925) Avail: NTIS HC A02/MF A01 CSCL 20L

It is recommended that various techniques be investigated which appear to have the potential for improving the radiation hardness of CMOS devices for prolonged space flight mission. The three key recommended processing techniques are: (1) making the gate oxide thin. It has been shown that radiation degradation is proportional to the cube of oxide thickness so that a relatively small reduction in thickness can greatly improve radiation resistance; (2) cleanliness and contamination control; and (3) to investigate different oxide growth (low temperature dry, TCE and HCL). All three produce high quality clean oxides, which are more radiation tolerant. Technique 2 addresses the reduction of metallic contamination. Technique 3 will produce a higher quality oxide by using slow growth rate conditions, and will minimize the effects of any residual sodium contamination through the introduction of hydrogen and chlorine into the oxide during growth. Author

N86-13188*# Clarkson Univ., Potsdam, N.Y. Dept. of Mechanical and Industrial Engineering.
MODELING OF CONVECTION PHENOMENA IN BRIDGMAN-STOCKBARGER CRYSTAL GROWTH Semiannual Progress

Report, 1 Feb. - 4 Aug. 1985
Frederick M. Carlson, Arsev H. Eraslan, and Ji-Zen Sheu 5 Nov. 1985 17 p refs
(Grant NAG1-397)
(NASA-CR-176325; NAS 1.26:176325) Avail: NTIS HC A02/MF A01 CSCL 20B

Thermal convection phenomena in a vertically oriented Bridgman-Stockbarger apparatus were modeled by computer simulations for different gravity conditions, ranging from earth conditions to extremely low gravity, approximate space conditions. The modeling results were obtained by the application of a state-of-the art, transient, multi-dimensional, completely densimetrically coupled, discrete-element computational model which was specifically developed for the simulation of flow, temperature, and species concentration conditions in two-phase (solid-liquid) systems. The computational model was applied to the simulation of the flow and the thermal conditions associated with the convection phenomena in a modified Germanium-Silicon charge enclosed in a stationary fused-silica ampoule. The results clearly indicated that the gravitational field strength influences the characteristics of the coherent vortical flow patterns, interface shape and position, maximum melt velocity, and interfacial normal temperature gradient. Author

N86-13189# North Carolina State Univ., Raleigh. Dept. of Physics.
COMPOUND SEMICONDUCTOR INSULATOR INTERFACE RESEARCH Final Report, Jul. 1981 - Jan. 1985
G. Lucovsky May 1985 37 p
(Contract F33615-81-C-1428)
(AD-A157277; AFWAL-TR-85-1035) Avail: NTIS HC A03/MF A01 CSCL 09/1

Work under this contact has been performed in two departments at North Carolina State University; the Departments of Physics and Chemistry. The major thrust of the research program has been in the area of semiconductor/insulator interfaces with the emphasis on the development of materials that could be used for gate insulators in Insulated Gate Field Effect Transistor Devices (IGFET's). To achieve this goal we collaborated with the research group at the Research Triangle Institute (RTI), (with additional support under NAVELEC Contract N00039-81-C-0661), and targeted our research efforts to the development of a gate insulator for (In,Ga)As IGFET's. We have designed and built a low temperature CVD deposition system, and developed a process, using Remote Plasma Enhanced CVD (RPECVD), for depositing a multilayer dielectric consisting of Si3N4 and SiO2 layers onto (In, Ga)As. We have determined the conditions necessary to achieve stoichiometry in each of the constituents layers. We have also determined the deposition conditions which minimize the incorporation of defect and impurity atom bonding groups. We have developed a model for the deposition process which can serve as a guideline for deposition of other silicon based insulators, e.g., SiN F and SiO F alloys. GRA

N86-13190# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
JOURNAL OF THE CHINESE SILICATE SOCIETY (SELECTED ARTICLES)
11 Jun. 1985 32 p Transl. into ENGLISH from Guisuanyan Xuebao (China), v. 11, no. 3, 1983 p 333-341, 357-360
(AD-A157497; FTD-ID(RS)T-0160-85) Avail: NTIS HC A03/MF A01 CSCL 20/2

The contents of a Chinese journal are given. The two titles of articles are: (1) The EFG Growth and Application of Small Diameter Sapphire Crystals in Tubular and Rod Shapes; and Study on the Surface Microtopography of Corundums Grown by Verneuil Method; Growing of Excellent Nd:YAG Crystals by Temperature Gradient Technique. GRA

N86-13191# Department of the Navy, Washington, D. C.
LIQUID PHASE EPITAXY (LPE) OF SILICON CARBIDE Patent Application
A. Addamiano, inventor (to Navy) Filed 6 Jun. 1985 16 p
(AD-D011825; US-Patent-Appl-SN-741784) Avail: NTIS HC A02/MF A01 CSCL 20/2

A method is described for making cubic SiC devices comprising the steps of preparing a preform consisting of high purity Si on which a layer of cubic SiC has been deposited by CVD; transferring the preform to a furnace containing a molten bath of Si saturated with SiC at a temperature of between 1600 to 1800 C, the saturation being insured by the use of a high purity graphite crucible for the Si; dipping the Si-SiC preform into the molten bath and allowing deposition of more cubic SiC on the SiC layer by reducing the temperature of the already formed cubic SiC layer from the preparing step in relation to the rest of the molten bath. Additional steps include adding P-type or N-type dopants to the molten bath or into the CVD process and repeating the above-mentioned steps to create cubic SiC homojunctions; and eliminating any Si adhereing to the surface of the cubic SiC layer. Author (GRA)

N86-13192# Stanford Univ., Calif. Center for Materials Research.
IMPROVED TECHNIQUES FOR THE GROWTH OF HIGH QUALITY CADMIUM TELLURIDE CRYSTALS Final Technical Report, 1 Jan. 1982 - 31 Dec. 1984
R. S. Feigelson and R. R. Route Jun. 1985 277 p
(Contract DAAG29-83-K-0023)
(AD-A157669; SU-CMR-85-3; ARO-19489.3-EL) Avail: NTIS HC A13/MF A01 CSCL 20/2

This report summarizes two years' work as part of a multiyear program on improved techniques for the growth of high quality cadmium telluride crystals and represents one of the most comprehensive studies of melt growth and defect characterization in CdTe reported to date. Extensive melt growth studied were carried out using the vertical Bridgman method. Growth parameters were systematically varied in order to determine the influence of seed orientation, thermal environment, and growth rate on crystal quality. Growth interface shapes were revealed using autoradiographic dopant tracing methods. Melt thermal profiling was also carried out to further evaluate growth interface shapes. Controlled convex growth interface shapes were generated by using the heat exchanger method. By this means some improvement in grain structure of the typically polycrystalline boules was accomplished. Low frequency melt vibrations during growth were also observed to improve grain structure and reduce dislocation density. Extensive defect characterization was also carried out using chemical etching methods, and later, synchrotron X-ray topography. Comparative studies of a broad selection of commercial CdTe substrates was carried out, and extensive defect structure was observed in all cases. Reduced dislocation densities and defect structures were accomplished using both low amplitude melt vibrations and doping with In 1IIC13. In the second case, solution hardening was assumed to be the mechanism responsible. For the case of melt vibration, the mechanism is not yet understood. GRA

N86-13193# Illinois Univ., Urbana. Dept. of Physics.
THEORETICAL STUDIES OF DEEP IMPURITY LEVELS IN TERNARY SEMICONDUCTOR ALLOYS Final Report, 1 Jul. 1977 - 31 May 1984
J. D. Dow 5 Jul. 1985 26 p
(Contract N00014-77-C-0537)
(AD-A157929) Avail: NTIS HC A03/MF A01 CSCL 20/12

The principal investigator has completed a sizeable research program studying superlattices, impurities in semiconductors, surface and interface states, Schottky barriers, many-body effects in X-ray and Auger spectra of metals, and the physics of semiconductive alloys. Here we list a few of the recent results pertaining to: Substitutional point defects; laser degradation; Central-cell scattering effects on mobility; Pressure dependence of deep levels; Deep levels in quaternary 3 to 5 alloys; Deep levels in SixGe1-x alloys; Deep levels in CuCl; Deep levels in 2 to 6 semiconductors; Hg1-xCdxTe; 4 to 6 semiconductors; Paired substitutional defects; Technological significance of the theory of paired and clustered defects; Defects at interfaces; Defects at surfaces and Schottky barrier heights; Intrinsic surface state; Intrinsic interface states;

Core excitons; Disordered systems; Thermal conductivity of superlattices; Metastable semiconductors; Technological importance of metastable semiconductors; Disordered superlattices; Phonons in 3 to 5 alloys; Deep levels in superlattices. GRA

N86-13194# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
NEW METHOD OF DETERMINING THE CURRENT CARRIER CONCENTRATION IN A SUBSTANCE IN THE STATE OF SUPERCONDUCTIVITY
F. P. Golotyuk 2 Aug. 1985 6 p Transl. into ENGLISH from Tr. Nikolayevskogo Korablestroitelnogo Inst. imeni Admirala S.O. Makarova (USSR), no. 57, 1972 p 110-112
(AD-A158182; FTD-ID(RS)T-1355-84) Avail: NTIS HC A02/MF A01 CSCL 20/3

This report proposes a fundamentally new solution to the problem of determining the current carrier concentration in a substance. The basis of the corresponding experimental method is a theory which considers the electron drift energy when considering the oscillatory processes in certain circuits. GRA

N86-13195# Little (Arthur D.), Inc., Cambridge, Mass.
DERIVATION OF THE OPTICAL CONSTANTS OF ANISOTROPIC Final Report, Jul. 1982 - Jul. 1985
J. R. Aronson, A. G. Emslie, E. M. Smith, and P. F. Strong 31 Jul. 1985 34 p
(Contract DAAG29-82-C-0017)
(AD-A158396; ARO-18649.5-CH) Avail: NTIS HC A03/MF A01 CSCL 20/2

This report concerns the development of methods for obtaining the optical constants of anisotropic crystals of the triclinic and monoclinic systems. The principal method used, classical dispersion theory, is adapted to these crystal systems by extending the Lorentz line parameters to include the angles characterizing the individual resonances, and by replacing the dielectric constant by a dielectric tensor. The sample crystals are gypsium, orthoclase and chalcanthite. The derived optical constants are shown to be suitable for modeling the optical properties of particulate media in the infrared spectral region. For those materials where suitable size single crystals are not available, an extension of a previously used method is applied to alabaster, a polycrystalline material of the monoclinic crystal system. GRA

N86-13196# California Univ., Berkeley. Lawrence Berkeley Lab.
IMPROVED BEVATRON LOCAL INJECTOR ION SOURCE PERFORMANCE
G. Stover and E. Zagec May 1985 6 p refs Presented at the Particle Accelerator Conf., Vancouver, British Columbia, 13 May 1985
(Contract DE-AC03-76SF-00098)
(DE85-015271; LBL-18964; CONF-850504-221) Avail: NTIS HC A02/MF A01

Performance tests of the improved Bevatron Local Injector PIG Ion source using particles of Si 4(+), Ne 3(+), and He 2(+) are described. Initial measurements of the 8.4 keV/nucleon Si 4(+) beam show an intensity of 100 particle microamperes with a normalized emittance of .06 (PI) cm-mrad. A low energy beam transport line provides mass analysis, diagnostics, and matching into a 200 MHz RFQ linac. The RFQ accelerates the beam from 8.4 to 200 keV/nucleon. The injector is unusual in the sense that all ion source power supplies, the ac distribution network, vacuum control equipment, and computer control system are contained in a four bay rack mounted on insulators which is located on a floor immediately above the ion source. The rack, transmission line, and the ion source housing are raised by a dc power supply to 80 kilovolts above the ground. All power supplies, which are referenced to rack ground, are modular in construction and easily removable for maintenance. The ac power is delivered to the rack via a 21 kVThe a, 3-phase transformer. DOE

N86-13197# Sandia National Labs., Albuquerque, N. Mex.
CHANNELING ANALYSIS OF STRAIN IN SUPERLATTICES
S. T. Picraux, W. K. Chu, W. R. Allen, and J. A. Ellison 1985 25 p Presented at the 7th Intern. Conf. on Ion Beam Anal., Berlin, 7 Jul. 1985 Prepared in cooperation with North Carolina Univ., Chapel Hill and New Mexico Univ., Albuquerque
(Contract DE-AC04-76DP-00789)
(DE85-014437; SAND-85-0592C; CONF-850716-1) Avail: NTIS HC A02/MF aA01

We review recent ion channeling methods for the analysis of the strain in epitaxially grow structures known as strained-layer superlattices (SLSs). These strain measurements have primarily utilized inclined-direction axial dechanneling or angular scans. More recently, a new channeling phenomenon, which involves as resonance between the planar channeling trajectory wavelength and the superlattice period, has been discovered in superlattices. Resonant conditions leading to both catastrophic dechanneling and resonant channeling are demonstrated for inclined planar directions in SLSs. Catastrophic dechanneling is shown to be the most sensitive of the channeling techniques for strain analysis. Comparison with detailed theoretical calculations shows that a simple modified-harmonic model can be used to extract the strain with relatively good accuracy from angular measurements of the catastropic dechanneling. DOE

N86-13198# Cornell Univ., Ithaca, N.Y. Dept. of Materials Science and Engineering.
DIFFRACTION AND MICROSCOPY STUDIES OF THE STRUCTURE OF GRAIN BOUNDARIES IN Fe, Fe-BASE ALLOYS AND CERAMIC MATERIALS Final Technical Report
S. L. Sass Aug. 1985 35 p
(Contract DE-AC02-81ER-10956)
(DE85-016950; DOE/ER-10956/18) Avail: NTIS HC A03/MF A01

The long range goal of this research program has been to obtain information on the atomic structure of grain boundaries in bcc metals and ceramics, to understand how segregation influences grain boundary structure and causes boundaries to become embrittled in Fe-base alloys, to understand how segregation and the ionization state of the solute influences the boundary structure in ceramic materials, and to study faceting and the frequency of its occurrence in ceramic materials. Electron microscopy and electron diffraction techniques were used to carry out the studies on grain boundaries. The research progress made during the support period of the contract is reviewed. DOE

N86-13199# Los Alamos National Lab., N. Mex.
TEMPERATURE AND CONCENTRATION DEPENDENCE OF HYDROGEN SITE OCCUPANCY IN SEVERAL RARE-EARTH DIHYDRIDES
J. A. Goldstone, J. Eckert, P. M. Richards, and E. L. Venturini 1985 13 p Presented at the Intern. Conf. on Neutron Scattering, Santa Fe, N. Mex., 19 Aug. 1985 Prepared in cooperation with Sandia Labs., Albuquerque, N. Mex.
(Contract W-7405-eng-36)
(DE85-015739; LA-UR-85-2683; CONF-850871-1) Avail: NTIS HC A02/MF A01

Neutron inelastic scattering and diffraction techniques are used to study the hydrogen site distribution in several rare earth dihydrides as a function of temperature and concentration. For Y, La, and Ce the fraction of hydrogen on octahedral sites is approximately a constant from 15K to 200K followed by a decrease with increasing temperature. A model is presented which qualitatively explains this behavior. DOE

N86-13200# Naval Research Lab., Washington, D. C.
ENERGY DISPERSIVE SPECTROSCOPY USING SYNCHROTRON RADIATION: INTENSITY CONSIDERATIONS
E. F. Skelton, W. T. Elam, S. B. Qadri, A. W. Webb, and D. Schiferl 1985 21 p refs Presented at the 10th High Conf. On Res. In High Pressure Sci. and Technol., Amsterdam, 8 Jul. 1985 Prepared in cooperation with Los Alamos National Lab., N. Mex.
(Contract W-7405-eng-36)
(DE85-017530; LA-UR-85-3064; CONF-850759-13) Avail: NTIS HC A02/MF A01

Detailed considerations are given to the reliability of energy

dependent integrated intensity data collected from the pressure cavity of a diamond-anvil pressure cell illuminated with heterochromatic radiation from a synchrotron storage ring. It is demonstrated that at least in one run, the electron beam current cannot be used to correct for energy-intensity variations of the incident beam. Rather there appears to be an additional linear relationship between the decay of the synchrotron beam and the magnitude of the background intensity. DOE

N86-13201# Oak Ridge National Lab., Tenn.
WEAR OF ION IMPLANTED TiB SUB 2 SURFACES
C. S. Yust, C. J. McHargue, C. L. White, P. Angelini, and M. B. Lewis 1985 10 p Presented at the Symp. on Tribology, Lyon, 3 Sep. 1985
(Contract DE-AC05-84OR-21400)
(DE85-017091; CONF-850952-1) Avail: NTIS HC A02/MF A01

The properties of polycrystalline titanium diboride surfaces were significantly modified by ion implantation. Nickel ion implantation at room temperature (1 x 10 to the 12th power ions/sq cm., 1 MeV) produced a damage, crystalline surface in which dislocation tangles and defects were observed to a depth of 750 nm. Surface hardness values as measured by the Knoop method were 1.7 to 2.2 times those of unimplanted material, and the indentation fracture toughness was increased 50 to 90%. Wear resistance was evaluated by pin-on-disc tests in which a diamond stylus rubs against a polished surface containing both implanted and unimplanted regions. Auger electron spectroscopy was used to identify the constituents of an adhered debris layer on the resultant wear tracks. The debris layer was found to contain some oxygen, but was composed primarily of carbon. DOE

N86-13202# Oak Ridge National Lab., Tenn.
RECENT DEVELOPMENTS IN THE STRUCTURAL CRYSTALLOGRAPHY OF BORON AND THE HIGHER BORIDES
H. L. Yakel 1985 13 p refs Presented at the Intern. Conf. on the Phys. and Chem. of Boron and Boron-Rich Borides, Albuquerque, N. Mex., 29 Jul. 1985
(Contract DE-AC05-84OR-21400)
(DE85-016930; CONF-850786-1) Avail: NTIS HC A02/MF A01

This paper reviews structural studies of boron and boron-rich borides over the last decade using as a framework the classification scheme proposed by Matkovich and Economy. Chemical bonding in boron polyhedral units and the packing of these units in normal 3D space lattices are described with emphasis on stabilization effects that may be produced by impurity elements. Potentially useful areas for structural work with several new scattering and spectroscopic techniques are suggested. The paper concludes with a discussion of possible connections between boride crystal chemistry and the developing subject of quasicrystalline structure. DOE

N86-13203# Oak Ridge National Lab., Tenn.
TEMPERATURE DEPENDENCE OF THE MAGNETIC EXCITATIONS IN Gd
J. W. Cable, R. M. Nicklow, and N. Wakabayashi Aug. 1985 13 p Presented at the Intern. Conf. on Magnetism, San Francisco, 26 Aug. 1985
(Contract DE-AC05-84OR-21400)
(DE85-016303; CONF-850890-14) Avail: NTIS HC A02/MF A01

Magnetic excitation spectra were measured for Gd in the ,001. and ,hh0. directions over the temperature range from 9 to 320 K (T sub c = 292.7, k). Spin-wave-like modes are observed at T greater than or equal to T sub c. The critical wavevector for the appearance of these modes is proportional to the inverse correlation length. DOE

N86-13204# Los Alamos Scientific Lab., N. Mex.
SUPERCONDUCTIVITY IN THE W-Tc AND W2C-Tc SYSTEMS
A. L. Giorgi 1985 11 p refs Presented at the Mater. and Mech. of Superconductivity Conf., Ames, Iowa, 29 May 1985
(Contract W-7405-eng-36)
(DE85-012711; LA-UR-85-1648; CONF-8505138-4) Avail: NTIS HC A02/MF A01

A series of compositions in the W-Tc, W2C-Re and W2C-Tc systems were prepared and examined for superconductivity. The crystal structure, lattice parameters and superconducting transition temperatures of the W2C-Tc are reported for the first time. Similar measurements were made on the W-Tc and W2C-Re systems and the results compared with previous published results for these systems. DOE

N86-13205# Kent State Univ., Ohio. Dept. of Physics.
QUANTUM SIMULATIONS OF SMALL ELECTRON-HOLE COMPLEXES
M. A. Lee, R. K. Kalia, and P. D. Vashishta Sep. 1984 13 p refs Presented at Midwest Solid State Theory Symp., in Microfiche Prod., Minneapolis, 6 Sep. 1984 Prepared in cooperation with Argonne National Lab., Ill.
(Contract W-31-109-eng-38)
(DE85-013895; CONF-8409228-2) Avail: NTIS HC A02/MF A01

The Green's Function Monte Carlo method is applied to the calculation of the binding energies of electron-hole complexes in semiconductors. The quantum simulation method allows the unambiguous determination of the ground state energy and the effects of band anisotropy on the binding energy. DOE

N86-13206# Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho.
MICROLUMINESCENCE SPECTRA OF Ti-ACTIVATED ZrO2-Y2O3
T. E. Doyle and J. L. Alvarez 1985 12 p Presented at the Joint Meeting of the Electron Microscopy Soc. of Am. and Microbeam Anal. Soc., Louisville, Ky., 5 Aug. 1985
(Contract DE-AC07-76ID-01570)
(DE85-010131; EGG-M-09185; CONF-850840-5) Avail: NTIS HC A02/MF A01

Sharp-line luminescence of titanium impurities in the system ZrO-Y2O3 has been investigated. Cubic ZrO2 and Zr3Y4O12 exhibit broadening of the luminescence lines which can be attributed to structural disorder. The sharp-line luminescence also provides a method for determining the phonon modes in cubic ZrC2. DOE

N86-13207# Argonne National Lab., Ill.
DECONFINEMENT TRANSITION ON A BCH LATTICE
E. Kovacs May 1985 10 p Presented at the 20th Recontre de Moriond, Les Arcs, France, 10 Mar. 1985
(Contract W-31-109-eng-38)
(DE85-013887; ANL-HEP-CP-85-33; CONF-850375-10) Avail: NTIS HC A02/MF A01

The results of a Monte Carlo simulation of pure SU(2) gauge theory at finite temperature on a body-centered hypercubic (BCH) lattice are presented. The behavior of the transition temperature as a function of the critical lattice coupling g' is compared with the prediction of asymptotic scaling as given by the perturbative (BETA) function. A comparison of the results for the BCH lattice and the simple hypercubic(SH) lattice provides important tests of universality. DOE

N86-13208# Oak Ridge National Lab., Tenn.
NEW INTERPRETATION OF SPIN-WAVE BEHAVIOR IN NICKEL AND IRON
J. F. Cooke, J. A. Blackman, and T. Morgan Jul. 1985 30 p Presented at the Intern. Conf. on Magnetism, San Francisco, 26 Aug. 1985 Prepared in cooperation with Reading Univ.
(Contract DE-AC05-84OR-21400)
(DE85-015323; CONF-850890-10) Avail: NTIS HC A03/MF A01

Calculations of the dynamic susceptibility based on itinerant electron theory for energies up to 1 eV have led to a new picture of spin-wave behavior in nickel and iron, in which spin-waves exist throughout most of the Brillouin zone and to much higher energies than previously thought possible. DOE

N86-13209# Los Alamos National Lab., N. Mex.
X-RAY DIFFRACTION STUDIES OF SHOCK-MODIFIED INORGANIC MATERIALS

B. Morosin and R. A. Graham 1985 16 p Presented at the Intern. Conf. on Met. Appl. of Shock Wave and High-Strain Rate Phenomena, Portland, Oreg., 28 Jul. 1985
(Contract DE-AC04-76DP-00789)
(DE85-015150; SAND-85-0405C; CONF-850889-4) Avail: NTIS HC A02/MF A01

Detailed analysis of broadened X-ray diffraction peak profiles has yielded information on the resulting residual lattice strain and reduced coherent crystallite size on a range of materials subjected to high pressure shock loading. Strain and size values are dependent on various procedures and models used for analysis of such peak profiles; however, trends on such strain and size data as a function of shock loading pressure and shock temperature depend very strongly on the material. For example, shock modified rutile shows annealing behavior at modest shock compression (20 to 27 GPa) due to shock temperature. Alumina and aluminum nitride appear to saturate to high strain values at the same conditions. Titanium diboride appears to show a pressure threshold in excess of 10 GPa before any plastic deformation occurs. The unusually large plastic deformation achieved in brittle inorganic powders indicates the unique nature of shock deformation; such deformations are not typically achieved by using other techniques. Such defective materials exhibit increased chemical activity and present the potential for synthesis of new substances as well as an opportunity to influence materials technology. DOE

N86-13210# University of Northern Illinois, De Kalb.
MOSSBAUER EFFECT AND NEUTRON DIFFRACTION STUDY OF THE ANOMALOUS LATTICE BEHAVIOR OF U6Fe
P. P. Vaishnava, A. E. Dwight, C. W. Kimball, J. D. Jorgensen, and F. Y. Fradin Jun. 1985 13 p Presented at the Mater. and Mech. of Superconductivity Conf., Ames, Iowa, 29 May 1985 Prepared in cooperation with Argonne National Lab., Ill.
(Contract W-31-109-eng-38)
(DE85-014912; CONF-8505138-10) Avail: NTIS HC A02/MF A01

Neutron diffraction and (57)Fe Moessbauer effect measurements have been made on the exchange-enhanced superconductor U6Fe. The neutron diffraction results indicate a pronounced anisotropy in the thermal expansion of the unit cell and an anomalous temperature dependence for the c-axis component of the total Debye-Waller factor of Fe below 100K. The Moessbauer effect measurements show non-Debye behavior in the mean-squared displacement of Fe, with phonon hardening occurring below 100K. The absence of a temperature dependence to the relative intensities of the lines in the Fe quadrupole doublet indicates almost isotropic lattice vibrations. Taken together these observations imply that Fe undergoes static displacements along the c-axis that begin below 100K and increase with decreasing temperature. Both the Moessbauer shift and the quadrupole coupling indicate electronic changes in the valence of Fe in the temperature region in which the displacement takes place. DOE

N86-13211# Ames Lab., Iowa.
JOSEPHSON EFFECT IN THE UNUSUAL SUPERCONDUCTORS Lu2Fe3Si5, LiTi2O4 AND UBe13
E. L. Wolf, R. J. Noer, S. Han, K. W. Ng, T. P. Chen, D. K. Finnemore, and L. Tanner 1985 12 p Presented at the Mater. and Mech. of Superconductivity Conf., Ames, Iowa, 29 May 1985
(Contract W-7405-eng-82)
(DE85-015260; IS-M-553; CONF-8505138-14) Avail: NTIS HC A02/MF A01

A Josephson supercurrent, which can be split by microwave photons of frequency nu into Shapiro steps of spacing (DELTA) V = hnu/2e, is expected between superconductors of like pairing type, either s or p-wave. A weaker, and possibly unobservable effect, with step spacing (DELTA)V/2 was predicted by Pals and van Haeringen between electrons of unlike pairing type. Experiments using K-band microwaves and a Nb point contact have been carried out at 1.2 K on the d-band superconductors LiTi2O4 and Lu2Fe3Si5. In both cases we find unambiguous indication of s-wave pairing, as in Nb. The same experiment on the heavy-fermion superconductor UBe13 in the range UBe13 has been induced into a state of s-wave superconductivity by proximity with the s-wave superconductor Nb. DOE

N86-13212# Illinois Univ., Urbana. Dept. of Physics.
SECOND ORDER ELASTIC CONTENTS OF Pd, PdH(0.7) AND PdD(0.7) BETWEEN 1.7 AND 50 K
D. B. Pokert, R. B. Schwarz (LANL), and A. V. Granato 1985 5 p Presented at Conf. on Internal Friction and Ultrasonic Attenuation in Solids, Urbana, Ill., 3 Jun. 1985
(Contract DE-AC05-84OR-21400)
(DE85-014316; CONF-8506125-4) Avail: NTIS HC A02/MF A01

The second order elastic constants, c11, c44, and c' are measured in pure Pd, PdH(sub 0.7) and PdD(sub 0.7) as a function of temperature between 1.8 and 50K. The data are fitted with polynomials c(sub ij) (1 - a(sub ij)T(2) - b(sub ij)T(4)). For Pd, a(sub ij)approx.10 to the -6 power and b(sub ij)approx.10 to the -10 power. With the addition of H or D, c11(0) decreases by 4%, c44(0) decreases by 7%, and c'(0) increases by 8%. The most significant change occurs for the a(sub ij), which decrease by a factor of 100. Furthermore, b11 remains unchanged, while b44 and b' decrease by factors of approximately 2-4. The changes in the c(sub ij)(0) cannot be explained simply in terms of the expansion of the Pd lattice with the addition of H or D. The decreases of the a(sub ij) are attributed to a decrease in the first and second derivatives of the electronic density of states at the Fermi energy of Pd that occurs with the filling of the d-states by the electrons from H or D. DOE

N86-13213# Oak Ridge National Lab., Tenn.
ELECTRONIC STAKES IN DISORDERED SOLIDS. PART 3: APPLICATIONS TO MATERIALS SCIENCE
J. S. Faulkner 1985 28 p Presented at the Sanibel Symp., Sanibel, Fla., 18 Mar. 1985
(Contract DE-AC05-84CR-21400)
(DE85-011416; CONF-8503147-1) Avail: NTIS HC A03/MF A01

The electronic states of many alloy systems have now been calculated using a framework of theory that is based on the coherent potential approximation. Some of the results of classic experiments on alloys are explained on the basis of these calculations. DOE

N86-12422# Joint Publications Research Service, Arlington, Va.
VARIATIONAL ANALYSIS OF PHASE TRANSITION IN PURE GAUGE FIELDS
Guo Shouhong, Liu Jinming, and Chen Qizhou *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-021) 8 Jul. 1985 p 76-84 refs Transl. into ENGLISH from Zhongshan Daxue Xuebao (Guangzhou), no. 4, Nov. 1984 p 48-54 (For primary document see N86-12421 03-31)
Avail: NTIS HC A09/MF A01

N86-12427# Joint Publications Research Service, Arlington, Va.
TITANIUM-NITROGEN ION BEAM INJECTION STUDIED
Jiang Xingliu, He Lianlong, Jiang Songchuan, and Chen Kefan *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-021) 8 Jul. 1985 p 129-131 refs Transl. into ENGLISH from Lanzhou Daxue Xuebao (Lanzhou), v. 20, no. 4, 28 Dec. 1984 p 123-124 (For primary document see N86-12421 03-31)
Avail: NTIS HC A09/MF A01

77 THERMODYNAMICS AND STATISTICAL PHYSICS

Includes quantum mechanics; and Bose and Fermi statistics.

For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer.*

N86-13214# California Univ., Berkeley. Lawrence Berkeley Lab.
CLASSICAL GEOMETRICAL INTERPRETATION OF GHOST FIELDS AND ANOMALIES IN YANG-MILLS THEORY AND

QUANTUM GRAVITY
J. Thierry-Mieg 14 May 1985 7 p Presented at the Symp. on Anomalies, Geometry and Topology, Argonne, Ill., 28 Mar. 1985 Prepared in cooperation with Centre National de la Recherche Scientifique, Meudon-Bellevue, France
(Contract DE-AC03-76SF-00098)
(DE85-014537; LBL-19671; CONF-8503141-3) Avail: NTIS HC A02/MF A01

The reinterpretation of the ERS equations of Quantum Field Theory as the Maurer Cartan equation of a classical principal fiber bundle leads to a simple gauge invariant classification of the anomalies in Yang Mills theory and gravity. DOE

N86-13215# Oak Ridge National Lab., Tenn.
COMPARATIVE FIRST- AND SECOND-LAW ANALYSIS OF AN ABSORPTION CYCLE
H. Perez-Blanco and L. Pan Jul. 1985 37 p refs
(Contract DE-AC05-84OR-21400)
(DE85-015066; ORNL/TM-9595) Avail: NTIS HC A03/MF A01

Generally, the basis of efficiency calculations and optimization studies of absorption cycles is the first law of thermodynamics. It is often argued that a first-law analysis does not produce all the information needed to optimize the absorption system. According to this line of thought, only an analysis based on the second law of thermodynamics gives the needed information. Assessment of the usefulness of second-law analysis as applied to absorption cycles seems adequate to determine the potential benefits of gathering the additional data for the absorbent-refrigerant combinations currently under consideration. To this end, a comparative first- and second-law analysis of a single-effect, lithium bromide-water absorption cycle is carried out here. An existing computer program and entropy values from the literature are used to analyze the cycle. The effects of temperature approaches in each heat exchanger and external heating/cooling fluid flow rates on the cycle performance are determined. A comparison of the results obtained via first- and second-law analyses reveals that the usefulness of the information depends on the boundaries of the system under consideration. Optimization of the absorption cycle itself, without considering the effect of external heating/cooling fluid flow rates at all, can be accomplished by first-law analysis. However, optimization of not only the cycle but also the external flow rates (i.e., the overall thermal system) is better accomplished by second-law analysis. Another interesting result of this study is that a critical temperature approach for cycle optimization can be found for the generator. In practical terms, this means that improving the heat exchanger in the generator will not always enhance the thermal performance of the cycle. DOE

N86-13216# Lawrence Livermore National Lab., Calif.
LARGE-BASIS SHELL-MODEL TECHNOLOGY IN NUCLEOSYNTHESIS AND COSMOLOGY
G. J. Mathews, S. D. Bloom, K. Takahashi, G. M. Fuller, and R. P. Hausman, Jr. May 1985 11 p refs Presented at the 20th Recontre de Moriond, Les Arcs, France, 10 Mar. 1985 Prepared in cooperation with Los Alamos National Lab., N. Mex.
(Contract W-7405-eng-48)
(DE85-012925; UCRL-92723; CONF-850375-3) Avail: NTIS HC A02/MF A01

We discuss various applications of the Lanczos method to describe properties of many-body microscopic systems in nucleosynthesis and cosmology. These calculations include: solar neutrino detectors; beta-decay of excited nuclear states; electron-capture rates during a core-bounce supernova; exotic quarked nuclei as a catalyst for hydrogen burning; and the quark-hadron phase transition during the early universe. DOE

N86-13217# Texas Univ., Austin. Inst. for Fusion Studies.
ALFVEN CONTINUUM WITH TOROIDICITY
S. Riyopoulos and S. M. Mahajan Jun. 1985 29 p
(Contract DE-FG05-80ET-53088)
(DE85-015821; DOE/ET-53088/185; IFSR-185) Avail: NTIS HC A03/MF A01

The symmetry property of the MHD wave propagation operator is utilized to express the toroidal eigenmodes as a superposition of the mutually orthogonal cylindrical modes. Because of the degeneracy among cylindrical modes with the same frequency but resonant surfaces of different helicity the toroidal perturbation produces a zeroth order mixing of the above modes. The toroidal eigenmodes of frequency (LC OMEGA)0(2) have multiple resonant surfaces, with each surface shifted relative to its cylindrical position and carrying a multispectral content. Thus a single helicity toroidal antenna of frequency (LC OMEGA)0 couples strongly to all different helicity resonant surfaces with matching local Alfven frequency. Zeroth order coupling between modes in the continuum and global Alfven modes also results from toroidicity and degeneracy. Our perturbation technique is the MHD counterpart of the quantum mechanical methods and is applicable through the entire range of the MHD spectrum. DOE

N86-13218# Texas Univ., Austin. Inst. for Fusion Studies.
TRANSPORT NEAR THE ONSET OF STOCHASTICITY
J. D. Meiss May 1985 28 p
(Contract DE-FG05-80ET-53088)
(DE85-014765; DOE/ET-53088/189; IFSR-189) Avail: NTIS HC A03/MF A01

For two-degree-of-freedom Hamiltonians, (e.g., a particle in a 2-D potential or the flow of magnetic field lines) an invariant torus in phase space acts as an absolute barrier for trajectories. When an invariant torus is destroyed by a perturbation, a remnant remains with gaps. This cantorus forms a formidable barrier even well into the stochastic regime. We show that correlation functions decay algebraically invalidating the common assumptions of chaos. The decay rate is given by a universal exponent, obtained from self-similar scaling. DOE

80 SOCIAL SCIENCES (GENERAL)

Includes educational matters.

N86-13219*# Akron Univ., Ohio. Dept. of Civil Engineering.
NASA LERC/AKRON UNIVERSITY GRADUATE COOPERATIVE FELLOWSHIP PROGRAM AND GRADUATE STUDENT RESEARCHERS PROGRAM Interim Report, Nov. 1981 - Oct. 1983
Demeter G. Fertis Oct. 1983 59 p refs
(Grants NAG3-50; NGT36-001-800; NGT36-001-801)
(NASA-CR-174826; NAS 1.26:174826; NAUFP-202-3) Avail: NTIS HC A04/MF A01 CSCL 05I

On June 1, 1980, the University of Akron and the NASA Lewis Research Center (LERC) established a Graduate Cooperative Fellowship Program in the specialized areas of Engine Structural Analysis and Dynamics, Computational Mechanics, Mechanics of Composite Materials, and Structural Optimization, in order to promote and develop requisite technologies in these areas of engine technology. The objectives of this program are consistent with those of the NASA Engine Structure Program in which graduate students of the University of Akron participate by conducting research at Lewis. This report is the second on this grant and summarizes the second and third year research effort, which includes the participation of five graduate students where each student selects one of the above areas as his special field of interest. Each student is required to spend 30 percent of his educational training time at the NASA Lewis Research Center and the balance at the University of Akron. His course work is judiciously selected and tailored to prepare him for research work in his field of interest. A research topic is selected for each student while in residence at the NASA Lewis Research Center, which is also approved by the faculty of the University of Akron as his thesis topic for a Master's and/or a Ph.D. degree. Author

N86-13220# Naval Postgraduate School, Monterey, Calif.
COMPUTER AIDED INSTRUCTION IN ENGINEERING M.S. Thesis
T. S. Rose Mar. 1985 53 p

(AD-A156828; AD-E301723) Avail: NTIS HC A04/MF A01 CSCL 05/9

This thesis presents evidence that computer aided instruction (CAI) is effective and can improve instructional efficiency when it is properly implemented. An overview of CAI in other colleges is presented as a source of ideas. The Department of Aeronautics of the Naval Postgraduate School is used as an example of where CAI can be applied. Procedures for the proper implementation of CAI are presented; and the summary includes specific recommendations for the Aeronautics Department. GRA

81 ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

N86-13221*# ECON, Inc., Princeton, N.J.
R AND D LIMITED PARTNERSHIPS (POSSIBLE APPLICATIONS IN ADVANCED COMMUNICATIONS SATELLITE TECHNOLOGY EXPERIMENT PROGRAM)
22 Jun. 1985 75 p refs
(Contract NASw-3339)
(NASA-CR-176333; NAS 1.26:176333; ECON-80-111) Avail: NTIS HC A04/MF A01 CSCL 05A

Typical R&D limited partnership arrangements, advantages and disadvantages of R&D limited partnership (RDLPs) and antitrust and tax implications are described. A number of typical forms of RDLPs are described that may be applicable for use in stimulating R&D and experimental programs using the advanced communications technology satellite. The ultimate goal is to increase the rate of market penetration of goods and/or services based upon advanced satellite communications technology. The conditions necessary for these RDLP forms to be advantageous are outlined. E.A.K.

N86-13222# Massachusetts Univ., Amherst. Dept. of Electrical and Computer Engineering.
DECENTRALIZED CONTROL OF SCHEDULING IN DISTRIBUTED SYSTEMS Final Report, 15 Dec. 1981 - 15 Feb. 1985
J. A. Stankovic 15 Feb. 1985 22 p
(AD-A157656) Avail: NTIS HC A02/MF A01 CSCL 09/2

A distributed processing system is defined as a collection of processor-memory pairs (hosts) that are physically and logically interconnected, with decentralized system-wide control of all resources, for the cooperative execution of application programs. Such systems may be dedicated to a single application or may implement a general purpose computing facility. By decentralized system-wide control is meant that there exists distributed resources in the system, that there is decentralized control of these resources (i.e., there is no single, central host in charge, nor is there a central state table), that there is system-wide cooperation between independent hosts which results in a single unified system. By system-wide cooperation is meant that the algorithms of the system operate for the good of the whole and not for a particular host. For systems meeting this restrictive definition of distributed processing, it is hypothesized that their reliability, extensibility, and performance will be better than a what is generally available today. In this report the term distributed processing refers to this very specific type of highly integrated distributed system. The major objective of this research project was to develop and compare decentralized scheduling algorithms for distributed processing systems. GRA

82 DOCUMENTATION AND INFORMATION SCIENCE

Includes information storage and retrieval technology; micrography; and library science.

For computer documentation see *61 Computer Programming and Software.*

N86-13223 Virginia Polytechnic Inst. and State Univ., Blacksburg.
IDENTIFYING AND EVALUATING COBOL COMPETENCIES FOR FOUR-YEAR INFORMATION SYSTEMS PROGRAMS Ph.D. Thesis
Doris Peeples Mason 1984 148 p
Avail: Univ. Microfilms Order No. DA8507199

This study determines how the COBOL competencies taught in information systems programs and those attained by information systems students compare to those needed on the job. Five research questions were posed: (1) What are introductory COBOL programming competencies required to be a COBOL programmer? (2) To what extent do information systems program faculty perceive that they have taught COBOL programming competencies? (3) What level of competence in COBOL programming do prospective employers expect information systems graduates to have on the job? (4) To what extent do information systems seniors perceive that they have developed COBOL programming competencies? (5) Which COBOL programming competencies did the faculty, prospective employers, and seniors rate similarly in regard to level of skill? The respondents in the study were information systems faculty, prospective employers of information systems graduates, and information systems seniors. Usable responses were received from 85.4% of the total population. Author

N86-13224*# National Aeronautics and Space Administration, Washington, D. C.
INDEX TO NASA NEWS RELEASES AND SPEECHES, 1984
1985 163 p
(NASA-TM-87514; NAS 1.15:87514) Avail: NTIS HC A08/MF A01 CSCL 05B

The Index to NASA News Releases and Speeches (1984) contains selected speeches and news releases issued by NASA Headquarters during the year 1984. The index was prepared by the NASA Scientific and Technical Information Facility operated for the National Aeronautical and Space Administration by PRC Government Information Systems. F.M.R.

N86-13225*# National Aeronautics and Space Administration, Washington, D. C.
MICROGRAVITY SCIENCE AND APPLICATIONS BIBLIOGRAPHY, 1985 REVISION
Elizabeth Pentecost, comp. (Universities Space Research Association, Washington, D.C.) Oct. 1985 106 p
(NASA-TM-88178; NAS 1.15:88178) Avail: NTIS HC A06/MF A01 CSCL 05B

This edition of the Microgravity Science and Applications (MSA) Bibliography is a compilation of Government reports, contractor reports, conference proceedings, and journal articles dealing with flight experiments utilizing a low-gravity environment to elucidate and control various processes or with ground-based activities that provide supporting research. It encompasses literature published but not cited in the 1984 Revision and that literature which has been published in the past year. Subdivisions of the bibliography include six major categories: Electronic Materials; Metal, Alloys, and Composites; Fluid Dynamics and Transports; Biotechnology; Glass and Ceramics; and Combustion. Also included are publications from the European, Soviet, and Japanese MSA programs. In addition, there is a list of patents and appendices providing a compilation of anonymously authored collection of reports and a cross reference index. Author

N86-13226# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.

AGGREGATING INDIVIDUAL PREFERENCES IN THE ANALYTIC HIERARCHY PROCESS APPLIED TO THE 1983 BATTELLE TAV STUDY M.S. Thesis
S. E. Reed 15 Mar. 1985 293 p
(AD-A155858; AFIT/GST/OS/85M-13) Avail: NTIS HC A13/MF A01 CSCL 09/2

This thesis showed that the Analytical Hierarchy Process (AHP) group priority vector was independent of three aggregation techniques: geometric mean input, arithmetic mean vector output, and majority rule output. The AHP consistency index was correlated (Kendall's Tau) with Kendall's Coefficient of Consistence when the AHP inputs were converted to a voting matrix - 0, 1/2, 1 for each pairwise comparison. Minor respondent dissatisfaction with the AHP priority vector suggested that the scale in surveys should be presented to reflect the ratio versus interval scale. Eleven judges from the 1983 Trans-Atmospheric Vehicle (TAV) steering committee participated. They completed pairwise comparisons throughout a revised hierarchy of the 1983 Battelle TAV study. The study includes Apple PASCAL computer codes to manipulate the input files. GRA

N86-13227# Corps of Engineers, St. Paul, Minn.
INFORMATION SYSTEMS PLAN
Apr. 1985 272 p
(AD-A157911) Avail: NTIS HC A12/MF A01 CSCL 09/2

The purpose of this study is to analyze what information the St. Paul District uses, who needs to share data, what are the costs of information management, and who should be responsible for information management. This pilot project authorizes the District to demonstrate the feasibility of automated approaches through the acquisition and use of high technology equipment. GRA

N86-13228# Naval Training Analysis and Evaluation Group, Orlando, Fla.
WORD LISTS TO LIMIT VOCABULARY IN TECHNICAL INFORMATION Final Report
J. P. Kincaid, W. C. McDaniel, and M. Pierce Feb. 1985 165 p
(AD-A157931; TAEG-TR-164) Avail: NTIS HC A08/MF A01 CSCL 05/2

This report describes eight word lists for use as part of an automated publishing system for technical information. The lists were developed under sponsorship of the Naval Technical Information Presentation Program (NTIPP), which has been designated as the focal point for research and development in DOD's project to automate the production of technical information (TI). DOD policy required accurate, current, and comprehensible technical information (TI) to carry out a variety of functions supporting DOD weapons systems and equipment. One of the specific goals of NTIPP is to increase comprehensibility of TI. The eight word lists in this report were developed to help achieve this by simplifying vocabulary. The first is a revision of the common word list originally developed with CRES (Computer Readability Editing System). It represents the core vocabulary of junior Navy enlisted personnel. GRA

N86-13229# Society for Industrial and Applied Mathematics, Philadelphia, Pa.
SURVEY AND EXPOSITORY PAPERS ON TOPICS OF CURRENT INTEREST IN APPLIED MATHEMATICS Final Report, 15 Mar. 1980 - 15 Mar. 1985
A. K. Kapila 24 Jul. 1985 6 p
(Contract DAAG29-80-C-0091)
(AD-A158418; ARO-13926.1-MA) Avail: NTIS HC A02/MF A01 CSCL 12/1

This report lists the titles and abstracts of survey and expository papers published in SIAM (Society for Industrial and Applied Mathematics) Review under a contract. Author (GRA)

N86-12686# Joint Publications Research Service, Arlington, Va.
HARDWARE AND SOFTWARE SUPPORT OF GEOLOGICAL-GEOPHYSICAL DATABASE Abstract Only
V. A. Ivanov, G. A. Ivanchenko, N. N. Karlson, and N. S. Yakovenko *In its* USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 68 Transl. into ENGLISH from Avtometriya (Novosibirsk), no. 6, Nov. - Dec. 1985 p 82-83 (For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

83 ECONOMICS AND COST ANALYSIS

Includes cost effectiveness studies.

N86-13230*# ECON, Inc., Alexandria, Va.
FEDERAL GOVERNMENT PROVISION OF THIRD-PARTY LIABILITY INSURANCE TO SPACE VEHICLE USERS Final Report
2 Jan. 1985 138 p refs
(Contract NASw-3339)
(NASA-CR-176346; NAS 1.26:176346; ECON-84-101) Avail: NTIS HC A07/MF A01 CSCL 05C

Support decisions concerning the provision by the Federal Government of third-party liability insurance for commercial space activities were studied. The practices associated with third-party liability insurance in the marine, aviation, and electric utility industries in addition to those industries associated with space missions were reviewed. Theoretical considerations of rate setting are discussed and a methodology to determine the period of time over which the insurers of each industry intend to set aside reserves to recover from a maximum liability loss should one occur is introduced. The data were analyzed to determine the setaside period in each industry, and to suggest reasonable standards from the insurer's point of view. Criteria for Federal provision of insurance are discussed, an interpretation of the Price-Anderson Act, determinants of the availability of commercial insurance, potential insurer liability, and measures of reasonableness for premium rates from the user's point of view are presented. Options available to the government regarding third part liability protection are presented. Author

84 LAW AND POLITICAL SCIENCE

Includes space law; international law; international cooperation; and patent policy.

N86-13231# Committee of Conference (U. S. Congress).
MAKING APPROPRIATIONS FOR THE DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT, AND FOR SUNDRY INDEPENDENT AGENCIES, BOARDS, COMMISSIONS, CORPORATIONS, AND OFFICES FOR THE FISCAL YEAR ENDING SEPTEMBER 30, 1986, AND FOR OTHER PURPOSES
Edward P. Boland Washington GPO 1985 28 p Conf. rept. to accompany H.R. 3038 presented by the Comm. of Conf., 99th Congr., 1st Sess., 8 Nov. 1985
(H-Rept-99-363; GPO-54-494) Avail: US Capitol, House Document Room

Testimony and support of appropriations for the Department of Housing and Urban Development, and for sundry independent agencies, boards, commissions, corporations, and offices are reported. For individual titles, see N86-13232 through N86-13232.

N86-13232# Committee of Conference (U. S. Congress).
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
In its Making Appropriations for the Dept. of HUD, and for Sundry Independent Agencies, Boards, Comm., Corp., and Offices for the Fiscal Year Ending Sep. 30, 1986, and for Other Purposes 1985 p 18-20 (For primary document see N86-13231 03-84)
Avail: US Capitol, House Document Room

Appropriations for the Following agencies: Department of Health and Human Services, NASA, National Science Foundation, Department of the Treasury, Veterans Administration, and Federal Home loan Bank Board, are reported. E.A.K.

N86-13233# Committee on Appropriations (U. S. Senate).
DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT, AND CERTAIN OTHER INDEPENDENT AGENCIES APPROPRIATIONS FOR FISCAL YEAR 1986, PART 1
Washington GPO 1985 877 p refs Hearings on H.R. 3629 before the Comm. on Appropriations, 99th Cong., 1st Sess., 14 Mar. 1985
(S-Hrg-99-221-Pt-1; GPO-43-660) Avail: Subcommittee of the Committee on Appropriations

James Beggs, NASA Administrator, presented his 1986 Fiscal Budget to the Senate Committee on Appropriations (99th Congress), during hearings on 14 May 1985, the Honorable Jake Garn presiding. The NASA request was $7.9 billion of which 2.9 billion is for research and development, including $354 million for aeronautical research and technology; $3.5 billion for space flight, control, and data communications; $149 million for construction of facilities; and $1.3 billion for research and program management. This was followed by a University of California (California Space Institute) report on Automation and Robotics, and Volumes 1 (executive Overview) and 2 (Technical Report) of NASA's Advanced Technology Advisory Committee (ATAC), entitled, Advancing Automation and Robotics Technology for the Space Station and the U.S. Economy. For individual titles, see N86-13234 through N86-13234.

N86-13234# Committee on Appropriations (U. S. Senate).
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
In its Dept. of HUD, and Certain Independent Agencies Appropriations for Fiscal Year 1986, Pt. 1 1985 p 1-407 refs (For primary document see N86-13233 03-84)
Avail: Subcommittee of the Committee on Appropriations

In response to Public Law 98-371, dated July 18, 1984, the NASA Advanced Technology Advisory Committee (ATAC) has studied automation and robotics for use in the Space Station and prepared this report to the House and Senate Committees on Appropriations. The report is divided into two volumes: the Executive Overview, Volume 1, presents the major findings of the study and recommends to NASA principles for advancing automation and robotics technologies for the benefit of the Space Station and of the U.S. economy in general; the Technical Report, Volume 2, provides background information on automation and robotics technologies and their potential. As a result of its study, the Advanced Technology Advisory Committee believes that a key element of technology for the Space Station is extensive use of advanced general-purpose automation and robotics. This could include many systems and devices (such as computer vision, expert systems, and dexterous manipulators) that have been made possible by recent advances in artificial intelligence, robotics, computer science, and microelectronics. Author

85 URBAN TECHNOLOGY AND TRANSPORTATION

Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.

For related information see *03 Air Transportation and Safety, 16 Space Transportation,* and *44 Energy Production and Conversion.*

N86-13235*# National Academy of Sciences - National Research Council, Washington, D. C. Panel on Vehicle Applications.
AERONAUTICAL TECHNOLOGY 2000: A PROJECTION OF ADVANCED VEHICLE CONCEPTS
1985 116 p
(Contract NASw-3455)
(NASA-CR-176322; NAS 1.26:176322) Avail: NTIS HC A06/MF A01; also available from Aeronautics and Space Engineering Board, National Research Council, 2101 Constitution Ave., N.W., Washington, D.C. 20418 CSCL 05A

The Aeronautics and Space Engineering Board (ASEB) of the National Research Council conducted a Workshop on Aeronautical Technology: a Projection to the Year 2000 (Aerotech 2000 Workshop). The panels were asked to project advances in aeronautical technologies that could be available by the year 2000. As the workshop was drawing to a close, it became evident that a more comprehensive investigation of advanced air vehicle concepts than was possible in the limited time available at the workshop would be valuable. Thus, a special panel on vehicle applications was organized. In the course of two meetings, the panel identified and described representative types of aircraft judged possible with the workshop's technology projections. These representative aircraft types include: military aircraft; transport aircraft; rotorcraft; extremely high altitude aircraft; and transatmospheric aircraft. Improvements in performance, efficiency, and operational characteristics possible through the application of the workshop's year 2000 technology projections were discussed. The subgroups also identified the technologies considered essential and enhancing or supporting to achieve the projected aircraft improvements. B.W.

N86-13236*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
OVERVIEW OF FREE-PISTON STIRLING TECHNOLOGY AT THE NASA LEWIS RESEARCH CENTER
Jack G. Slaby 1985 21 p refs Presented at the 23rd Automotive Technol. Develop. Contractors' Coordination Meeting, Dearborn, Mich., 21-24 Oct. 1985; sponsored by DOE
(Contract DE-AI05-82OR-1005)
(NASA-TM-87156; E-2783; DOE/NASA-1006/7; NAS 1.15:87156) Avail: NTIS HC A02/MF A01 CSCL 10B

An overview of the National Aeronautics and Space Administration (NASA) Lewis Research Center (Lewis) free-piston Stirling engine activities is presented. These activities include: (1) a generic free-piston Stirling technology project being conducted to develop technologies synergistic to both space power and terrestrial heat pump applications in a cooperative, cost-shared effort with the Department of Energy (DOE/Oak Ridge National Laboratory (ONRL)), and (2) a free-piston Stirling space-power technology demonstration project as part of the SP-100 program being conducted in support of the Department of Defense (DOD), DOE, and NASA/Lewis. The generic technology effort includes extensive parametric testing of a 1 kw free-piston Stirling engine (RE-1000), development and validation of a free-piston Stirling performance computer code, and fabrication and initial testing of an hydraulic output modification for the RE-1000 engine. The space power technology effort, under SP-100, addresses the status of the 25 kWe Space Power Demonstrator Engine (SPDE) including early test results. Author

N86-13237# Office of Naval Research, London (England).
EUROPEAN SCIENCE NOTES. VOLUME 39, NUMBER 8
L. E. Shaffer Aug. 1985 52 p
(AD-A157146; ESN-39-8) Avail: NTIS HC A04/MF A01 CSCL 05/2

Volume 9, Number 8 of European Space Notes, contains articles on the following topics: the psychology of left-handedness; the International Low-Temperature Biological Microscopy and Analysis Meeting; the AGARD lecture series on the Impact of Proposed Radio Frequency Radiation Standards on Military Operations; the Brain Research Institute, University of Zurich; advances in Command, Control, and Communication systems; the Spete Institute for Strength of Materials and Welding Technology, University of Ghent, Belgium; Mathematicians Working With Industry -- the Oxford Example; Surface-Wave and Ship-Resistance Research in Israel; Electro-Optics, Quantum Electronics, and Related Topics Pursued at the Hirst Research Center; and the Laser Research Center at Hull University, UK. GRA

N86-13238# Naval Surface Weapons Center, Silver Spring, Md.
NAVAL SURFACE WEAPONS CENTER TECHNOLOGY TRANSFER BIENNIAL REPORT (FISCAL YEAR 1983/1984) Biennial Report, Fiscal Year 1983-1984
R. D. Johnson 1 Oct. 1984 51 p

(AD-A157919; NSWC/MP-85-58) Avail: NTIS HC A04/MF A01 CSCL 13/10

This report describes the Naval Surface Weapons Center Technology Transfer Program and presents narrative summaries of related projects performed during FY83/84422. Technology Application Assessments and a listing of patents/Navy cases for this time period are also presented. The objectives of Navy technology transfer are (1) to disseminate non-critical technology, originally developed in support of military applications, for potentially alternative uses in the public and private sectors; and (2) to promote joint cooperative development programs that address problems of mutual concern to the Navy and other agencies or organizations. Representative Narrative Summaries are: Manufacturing Technology, U.S. Coast Guard Diving Equipment Program, Space Shuttle Booster Water Entry, Solid Rocket Booster (SRB) Hazard Study, Hydroballistic Facility, High Altitude Parachute Deployment, College Computer Science Program, Hydrogen Gas Generator, Undersea Weapons Tank. GRA

88 SPACE SCIENCES (GENERAL)

N86-13239*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

SECOND WORKSHOP ON SPACECRAFT GLOW

J. Hunter Waite, Jr., ed. and T. W. Moorehead, ed. Sep. 1985 294 p refs Workshop held in Huntsville, Ala., 6-7 May 1985; sponsored in part by the Universities Space Research Association

(NASA-CP-2391; M-502; NAS 1.55:2391) Avail: NTIS HC A13/MF A01 CSCL 03B

Various aspects of space glow were considered. Results of a workshop held on May 6 to 7, 1985, at the Space Science Laboratory of NASA/Marshall Space Flight Center, Huntsville, Alabama are presented. The topics of discussion are divided as follows: (1) in situ observations; (2) theoretical calculations; (3) laboratory measurements; and (4) future experiments. For individual titles, see N86-13240 through N86-13269.

N86-13240*# Lockheed Missiles and Space Co., Palo Alto, Calif.

VEHICLE GLOW MEASUREMENTS ON THE SPACE SHUTTLE

Steven B. Mende and Gary R. Swenson *In* NASA. Marshall Space Flight Center 2d Workshop on Spacecraft Glow Sep. 1985 p 1-34 refs (For primary document see N86-13239 03-88)

(Contract NAS8-32579)

Avail: NTIS HC A13/MF A01 CSCL 03B

From the combined data set of glow observations on shuttle flight STS-3, STS-4, STS-5, STS-8, STS-9, 41-E, and 41-G some of the properties of the shuttle glow are discussed. Comparison of the STS-3 and STS-5 (240 and 305 km altitude, respectively) photographs shows that the intensity of the glow is about a factor of 3.5 brighter on the low-altitude (STS-3) flight. In an experiment to observe the dependence of the intensity on the ram angle, the angle of incidence between the spacecraft surface normal and the velocity vector, the Orbiter was purposely rotated about the x axis on the STS-5 mission. For a relatively large angle between the velocity vector and the surface normal there is an appreciable glow, provided the surface is not shadowed by some other spacecraft structure. As the angle becomes less the glow intensifies. Material samples were also exposed in the ram direction during nightside orbits and the glow surrounding the samples was photographed. Author

N86-13241*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

SPACE SHUTTLE RAM GLOW: IMPLICATION OF NO2 RECOMBINATION CONTINUUM

Gary R. Swenson (LMSC, Palo Alto, Calif.), Steven B. Mende (LMSC, Palo Alto, Calif.), and Stu Clifton *In its* 2d Workshop on Spacecraft Glow Sep. 1985 p 25-45 refs (For primary document see N86-13239 03-88)

Avail: NTIS HC A13/MF A01 CSCL 03B

The ram glow data gathered to data from imaging experiments on space shuttle suggest the glow is a continuum (within 34 angstrom resolution); the continuum shape is such that the peak is near 7000 angstroms decreasing to the blue and red, and the average molecular travel leading to emission after leaving the surface is 20 cm (assuming isotropic scattering from the surface). Emission continuum is rare in molecular systems but the measured spectrum does resemble the laboratory spectrum of NO2 (B) recombination continuum. The thickness of the observed emission is consistent with the NO2 hypothesis given an exit velocity of approx. 2.5 km/sec (1.3 eV) which leaves approx. 3.7 eV of ramming OI energy available for unbonding the recombined NO2 from the surface. The NO2 is formed in a 3-body recombination of OI + NO + [m] = NO2 + [m] where OI originates from the atmosphere and NO is chemically formed on the surface from atmospheric NI and OI. The spacecraft surface then acts as the [n] for the reaction: Evidence exists from orbital mass spectrometer data that the NO and NO2 chemistry described in this process does occur on surfaces of spectrometer orifices in orbit. Surface temperature effects are likely a factor in the NO sticking efficiency and, therefore, glow intensities. Author

N86-13242*# Augsburg Univ. (West Germany). Dept. of Physics.

AE AND DE MASS SPECTROMETER OBSERVATIONS RELEVANT TO THE SHUTTLE GLOW **c35**

Mark J. Engebretson *In* NASA. Marshall Space Flight Center 2d Workshop on Spacecraft Glow Sep. 1985 p 46-54 refs (For primary document see N86-13239 03-88)

(Grant NAG5-349)

Avail: NTIS HC A13/MF A01 CSCL 03B

Recent work suggested that NO2 may be responsible for the observed continuum glow near surfaces of the space shuttle. The observations of atomic nitrogen (N) are reported at shuttle altitudes using mass spectrometers, giving special attention to the surface reactions of N relevant to the production of NO2 on spacecraft surfaces. Data from two semi-open sources mass spectrometers, the OSS instruments on the Atmosphere Explorer-C and -D satellites, and the closed source Neutral Atmospheric Composition Spectrometer (NACS) on the Dynamic Explorer-2 satellite are presented to show the similar behavior of NO in each case and the contrasting behavior of NO2. Although signals of NO and NO2 are highly dependent on surface temperature and surface composition, it appears that direct exposure of ion source surfaces to rammed gas is a necessary condition for the production of large amounts of NO2. Evidence that elevated surface temperatures can significantly reduce the production of NO2, likely by causing more rapid desorption of NO from these surfaces, is presented. Author

N86-13243*# Harvard-Smithsonian Center for Astrophysics, Cambridge, Mass.

THE ATMOSPHERE EXPLORER AND THE SHUTTLE GLOW

A. Dalgarno, J.-H. Yee, and M. LeCompte *In* NASA. Marshall Space Flight Center 2d Workshop on Spacecraft Glow Sep. 1985 p 55-62 refs (For primary document see N86-13239 03-88)

(Grant NAGw-496; Contract F19628-88-C-0034; Grant NSF ATM-84-07314)

Avail: NTIS HC A13/MF A01 CSCL 03B

Recent analyses of the Atmosphere Explorer data are discussed in which it is demonstrated that the satellite glows have two components, one at high altitudes which is consistent with excitation in single collisions of atmospheric oxygen atoms with the vehicle surface and the other at low altitudes which is consistent with double collisions of nitrogen molecules. Contrary to an earlier suggestion, the low-altitude data are not consistent with collisions of oxygen molecules. The separation of the two components strengthens the conclusion that the high-altitude glow arises from vibrationally excited OH molecules produced by a formation mechanism that is different from that leading to the normal atmospheric OH airglow. The spectrum is consistent with associa-

tion of oxygen and hydrogen atoms at sites on the surface into the vibrational levels of OH. The low-altitude glow is consistent with the green mechanism but there are difficulties with it. The shuttle glows are different and have the spectral appearance of emission from NO2. The characteristics of the shuttle glows and the satellite glows will be contrasted and a tentative resolution of the differences in the Atmosphere Explorer and shuttle glows will be offered. Author

N86-13244*# National Research Council of Canada, Ottawa (Ontario). Inst. of Astrophysics.
ORBITER GLOW OBSERVATIONS AT HIGH SPECTRAL RESOLUTION c35
David J. W. Kendall, Richard L. Gattinger, Edward J. Llewellyn (Saskatchewan Univ.), Ian C. McDade (Saskatchewan Univ.), and Steven B. Mende (LMSC, Palo Alto, Calif.) *In* NASA. Marshall Space Flight Center 2d Workshop on Spacecraft Glow Sep. 1985 p 63-73 refs Sponsored in part by the Universities Space Research Association. (For primary document see N86-13239 03-88)
Avail: NTIS HC A13/MF A01 CSCL 03B

An experiment flow on mission STS 41-G as part of the Canadian complement of experiments was designed to obtain relatively high resolution spectra of the Orbiter glow phenomenon over limited spectral regions centered on prominent upper atmospheric emissions. Observations were carried out successfully at altitudes of 360 km and 230 km although those at the lower altitude were limited by degradation of the image intensifier. Definitive glow results were obtained at the end of a thruster firing which showed the spectrum to be a continuum at a resolution of approximately 0.4 nm centered at a wavelength of 360 nm. Results at other wavelengths in the absence of any firings strongly suggest that the Orbiter glow is a continuum throughout the spectral region 550 nm to 760 nm. A discussion is presented that considers the reaction NO + O2 as being a possible candidate for the mechanism producing the shuttle glow. Author

N86-13245*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
NEUTRAL MASS SPECTROMETER MEASUREMENTS IN THE SHUTTLE BAY ENVIRONMENT c35
E. Miller and G. Carignan (Michigan Univ.) *In its* 2d Workshop on Spacecraft Glow Sep. 1985 p 74-81 refs (For primary document see N86-13239 03-88)
Avail: NTIS HC A13/MF A01 CSCL 03B

A neutral mass spectrometer, flown as part of the Induced Environment Contamination Monitor (IECM), is briefly described. Results from STS-2, -3, -4, and Spacelab 1 are qualitatively summarized. The gases observed were, for the most part, those with molecular weights below 45 amu with sources attributable to instrument background, shuttle-induced environment, and the ambient atmosphere. The most abundant gases were H2O, N2, and He. Heavier gases consisted primarily of fluorocarbons. Author

N86-13246*# Physical Sciences, Inc., Andover, Mass. Atmospheric Sciences Group.
SPECTRAL IDENTIFICATION/ELIMINATION OF MOLECULAR SPECIES IN SPACECRAFT GLOW
B. D. Green, W. J. Marinelli, and W. T. Rawlins *In* NASA. Marshall Space Flight Center 2d Workshop on Spacecraft Glow Sep. 1985 p 82-97 refs Sponsored by AFGL (For primary document see N86-13239 03-88)
Avail: NTIS HC A13/MF A01 CSCL 03B

Computer models of molecular electronic and vibrational emission intensities were developed. Known radiative emission rates (Einstein coefficients) permit the determination of relative excited state densities from spectral intensities. These codes were applied to the published spectra of glow above shuttle surface and to the Spacelab 1 results of Torr and Torr. The theoretical high-resolution spectra were convolved with the appropriate instrumental slit functions to allow accurate comparison with data. The published spacelab spectrum is complex but N2+ Meinel emission can be clearly identified in the ram spectrum. M2 First Positive emission does not correlate well with observed features, nor does the CN Red System. Spectral overlay comparisons are presented. The spectrum of glow above shuttle surfaces, in contrast to the ISO data, is not highly structured. Diatomic molecular emission was matched to the observed spectral shape. Source excitation mechanisms such as (oxygen atom)-(surface species) reaction product chemiluminescence, surface recombination, or resonance fluorescent re-emission will be discussed for each tentative assignment. These assignments are the necessary first analytical step toward mechanism identification. Different glow mechanisms will occur above surfaces under different orbital conditions. Author

N86-13247*# Utah State Univ., Logan. Dept. of Physics.
THE UV-VIS OPTICAL ENVIRONMENT OF THE SHUTTLE c35
Marsha R. Torr *In* NASA. Marshall Space Flight Center 2d Workshop on Spacecraft Glow Sep. 1985 p 98-106 refs (For primary document see N86-13239 03-88)
(Contract NAS8-33992)
Avail: NTIS HC A13/MF A01

During the Spacelab 1 shuttle mission, spectroscopic measurements were made of the atmospheric emissions over a broad wavelength range extending from the extreme ultraviolet to the near infrared. Those measurements were made under a variety of vehicle attitude and sunlight conditions. Superimposed on such spectra would be any features associated with the induced vehicle environment and its interaction with solar photons and the ambient neutral atmosphere and plasma. Various anomalies and unexpected features in the spectra from the perspective of possible shuttle-induced origins are discussed. The data indicate a dramatic cleanup of the vehicle environment over the course of the 10-day mission, a strong non-atmospheric red continuum underlying the spectra at night and at large angles to the velocity vector, and a variety of molecular band distributions which are not explained by the present understanding of the atmosphere. Author

N86-13248*# Utah State Univ., Logan. Dept. of Physics.
ENHANCED N(+) SUB 2 IN THE SHUTTLE ENVIRONMENT Abstract Only c35
Doug G. Torr, A. Khoyloo, and Marsha R. Torr *In* NASA. Marshall Space Flight Center 2d Workshop on Spacecraft Glow Sep. 1985 p 107 (For primary document see N86-13239 03-88)
Avail: NTIS HC A13/MF A01 CSCL 03B

Observations were made of the N2 first negative and Meinel emission bands with the Imaging Spectrometric Observatory (ISO) on Spacelab 1. These observations have revealed the presence of N2 emissions which exceed those expected on the basis of current ionospheric models by up to a factor of 10. If the emission is of terrestrial origin, large unidentified ionospheric sources of N2 ions must exist. On the other hand, if the source is local to the shuttle environment, a mechanism must be found which is capable of generating emissions of such unexpectedly large intensity. Charge exchange of ambient ionospheric O+ ions with shuttle environmental N2, followed by resonance scattering of sunlight, as a candidate were suggested. However, this model implies that a cloud of N2 gases must surround the vehicle in concentrations in excess of 10 to the 11 c.c. cm with a scale length of tens of meters. In addition, the N2 residence time must be of the order of 10 sec. Author

N86-13249*# California Univ., Berkeley. Space Sciences Lab.
INVESTIGATION OF VEHICLE GLOW IN THE FAR ULTRAVIOLET c35
Supiya Chakrabarti and Timothy Sassen *In* NASA. Marshall Space Flight Center 2d Workshop on Spacecraft Glow Sep. 1985 p 108-115 refs (For primary document see N86-13239 03-88)
(Contract NAS8-32577)
Avail: NTIS HC A13/MF A01 CSCL 03B

To data, all vehicle glow observations have been conducted in the visible and near infrared wavelength regions. As the Space Telescope's wavelength coverage extends to the far ultraviolet range and current plasma theory of the spacecraft glow phenomena

predicts bright glow intensities, a study of the ram glow effects in the 800-1400 angstrom region was undertaken. The data were collected between March 21-28, 1979, from 600 km altitude near local midnight by the University of California, Berkeley's extreme ultraviolet spectrometer on board the polar orbiting STP78-1 satellite. Data from several nighttime orbits obtained outside the South Atlantic Anomaly region and within + or - 30 deg magnetic latitude range were separated into forward (south viewing) and backward (north viewing) bins. Each of these binds was subdivided into three directional categories: (1) up (zenith angles 30-80 deg), (2) side (zenith angles 80-100 deg), and (3) down (zenith angles 120-150 deg). The maximum ram glow effects are expected in the side viewing directions. Our data include possible effects of ram glow signatures in the 800-1400 angstrom wavelength region. Author

N86-13250*# Science Applications International Corp., McLean, Va.
SPACECRAFT-INDUCED PLASMA ENERGIZATION AND ITS ROLE IN FLOW PHENOMENA
K. Papadopoulos (Maryland Univ., College Park) and R. A. Smith *In* NASA. Marshall Space Flight Center 2d Workshop on Spacecraft Glow Sep. 1985 p 119-128 refs (For primary document see N86-13239 03-88)
(Contract F19628-85-C-0024)
Avail: NTIS HC A13/MF A01 CSCL 03B

Plasma instabilities induced by orbiting vehicles can cause many important phenomena ranging from electron and ion heating and suprathermal electron tail energization, to enhanced ionization and optical emissions. We outline the basic collective processes leading to plasma energization near plasma sheaths and in regions of neutral gas streaming through plasma, and discuss the role of the induced collective effects in producing the optical emission spectra. Author

N86-13251*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
SHUTTLE VERTICAL FIN FLOWFIELD BY THE DIRECT SIMULATION MONTE CARLO METHOD
J. E. Hueser (Old Dominion Univ.), F. J. Brock (Old Dominion Univ.), and L. T. Melfi *In* NASA. Marshall Space Flight Center 2d Workshop on Spacecraft Glow Sep. 1985 p 129-138 refs (For primary document see N86-13239 03-88)
Avail: NTIS HC A13/MF A01 CSCL 03B

The flow properties in a model flowfield, simulating the shuttle vertical fin, determined using the Direct Simulation Monte Carlo method. The case analyzed corresponds to an orbit height of 225 km with the freestream velocity vector orthogonal to the fin surface. Contour plots of the flowfield distributions of density, temperature, velocity and flow angle are presented. The results also include mean molecular collision frequency (which reaches 1/60 sec near the surface), collision frequency density (approaches 7 x 10 to the 18/cu m sec at the surface) and the mean free path (19 m at the surface). Author

N86-13252*# Science and Engineering Associates, Inc., Englewood, Colo.
A MECHANISM FOR THE LOCAL CONCENTRATION ENHANCEMENT OF THE SHUTTLE ATMOSPHERE
Ray Rantanen, Roy Swanson (Boeing Aerospace Co.), and Doug G. Torr (Utah State Univ., Logan) *In* NASA. Marshall Space Flight Center 2d Workshop on Spacecraft Glow Sep. 1985 p 139-148 refs (For primary document see N86-13239 03-88)
Avail: NTIS HC A13/MF A01 CSCL 03B

Preliminary calculations suggest that collisions between instreaming atmospheric constituents and secondary backscattered molecules can generate unexpectedly large enhancements in neutral gas concentrations in the vicinity of the shuttle. This effect is a result of a rapid decrease in the mean free path length of the scattered components following the initial expected concentration enhancement. A study will be outlined for the theoretical investigation of this mechanism. The shape dependence of associated glow halos on vehicle configuration will be discussed. Author

N86-13253*# Photometrics, Inc., Woburn, Mass.
SURFACE-CATALYZED RECOMBINATION INTO EXCITED ELECTRONIC, VIBRATIONAL, ROTATIONAL, AND KINETIC ENERGY STATES: A REVIEW
I. L. Kofsky and J. L. Barrett *In* NASA. Marshall Space Flight Center 2d Workshop on Spacecraft Glow Sep. 1985 p 149-154 refs (For primary document see N86-13239 03-88)
Avail: NTIS HC A13/MF A01 CSCL 03B

Laboratory experiments in which recombined CO, CO2, D2O, OH, N2, H2, and O2 molecules desorb from surfaces in excited internal and translational states are briefly reviewed. Unequilibrated distributions predominate from the principally catalytic metal substrates so far investigated. Mean kinetic energies have been observed up to approx. 3x, and in some cases less than, wall-thermal; the velocity distributions generally vary with emission angle, with non-Lambertian particle fluxes. The excitation state populations are found to depend on surface impurities, in an as yet unexplained way. Author

N86-13254*# Photometrics, Inc., Woburn, Mass.
INFRARED EMISSION FROM DESORBED NO2(*) AND NO(*)
I. L. Kofsky and J. L. Barrett *In* NASA. Marshall Space Flight Center 2d Workshop on Spacecraft Glow Sep. 1985 p 155-164 refs (For primary document see N86-13239 03-88)
Avail: NTIS HC A13/MF A01 CSCL 03B

Infrared photons from the radiative cascade accompany both the gas phase NO2 continuum chemiluminescence (which originates from its 2B2 and 2B1 states) and the NO beta bands. When these upper electronic states are excited by recombination/desorption at surfaces of low Earth orbiting spacecraft, similar IR emission spectrums will be observed. The principal NO2 features (other than the long wavelength tail of its electronic transitions) are the nu sub 3 fundamental sequence near 6.2 microns and nu sub 1 + nu sub 3 intercombination bands near 3.6 microns; NO would emit the delta v=1 and delta v=2 systems above 5.3 and 2.7 microns. Because of the long radiative lifetimes of the upper vibrational states, the infrared radiances in projections parallel to the vehicle surface (which we estimate) are substantially less than those of the visible and ultraviolet glows. Author

N86-13255*# Photometrics, Inc., Woburn, Mass.
THE NO-NO2 SYSTEM AT LABORATORY SURFACES
J. L. Barrett and I. L. Kofsky *In* NASA. Marshall Space Flight Center 2d Workshop on Spacecraft Glow Sep. 1985 p 165-168 refs (For primary document see N86-13239 03-88)
Avail: NTIS HC A13/MF A01 CSCL 03B

Experiments on formation and excitation of NO2 and NO molecules at (and near) laboratory surfaces of varying degrees of characterization are reviewed. On some transition metals NO is desorbed in the B sub 2 pi state, from which it radiates the familiar beta (B yields x) bands. In contrast while an ONO intermediate is inferred from isotope interchange measurements on platinum, neither ground state nor excited NO2 has been found to be desorbed under the relatively limited number of laboratory conditions so far investigated. Author

N86-13256*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
A MODEL FOR EXPLAINING SOME FEATURES OF SHUTTLE GLOW
Palmer N. Peters *In its* 2d Workshop on Spacecraft Glow Sep. 1985 p 169-173 refs (For primary document see N86-13239 03-88)
Avail: NTIS HC A13/MF A01 CSCL 03B

A solid state model is proposed which hopefully removes some of the objections to excited atoms being sources for light emanating from surfaces. Glow features are discussed in terms of excited oxygen atoms impinged on the surface, although other species could be treated similarly. Band formation, excited lifetime shortening and glow color are discussed in terms of this model.

The model's inability to explain glow emanating above surfaces indicates a necessity for other mechanisms to satisfy this requirements. Several ways of testing the model are described. Author

N86-13257*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
THE PRODUCTION OF GLOW PRECURSORS BY OXIDATIVE EROSION OF SPACECRAFT SURFACES c35
John C. Gregory (Alabama Univ., Huntsville) and Palmer N. Peters *In its* 2d Workshop on Spacecraft Glow Sep. 1985 p 174-179 refs (For primary document see N86-13239 03-88)
(Contract NAS8-36189)
Avail: NTIS HC A13/MF A01 CSCL 03B

Erosion rates of organic materials are measured during a recent flight of the shuttle (STS-8). Several forms of carbon and a variety of thermosetting and thermoplastic polymers are exposed to the ram beam of atomic oxygen. Arrhenius energies of about 1000 to 2000 cal/mole were measured from the rate dependencies on temperature. If some simple assumptions are made about the chemical nature of the desorbed species, the data can be used to estimate production rates at surfaces in orbit under different conditions of temperature, oxygen atom flux, and material surface conditions. Author

N86-13258*# Los Alamos National Lab., N. Mex.
ACTIVATED RECOMBINATIVE DESORPTION: A POTENTIAL COMPONENT IN MECHANISMS OF SPACECRAFT GLOW
Jon B. Cross *In* NASA. Marshall Space Flight Center 2d Workshop on Spacecraft Glow Sep. 1985 p 180-188 refs (For primary document see N86-13239 03-88)
Avail: NTIS HC A13/MF A01 CSCL 03B

The concept of activated recombination of atomic species on surfaces can explain the production of vibrationally and translationally excited desorbed molecular species. Equilibrium statistical mechanics predicts that the molecular quantum state distributions of desorbing molecules is a function of surface temperature only when the adsorption probability is unity and independent of initial collision conditions. In most cases, the adsorption probability is dependent upon initial conditions such as collision energy or internal quantum state distribution of impinging molecules. From detailed balance, such dynamical behavior is reflected in the internal quantum state distribution of the desorbing molecule. This concept, activated recombinative desorption, may offer a common thread in proposed mechanisms of spacecraft glow. Using molecular beam techniques and equipment available at Los Alamos, which includes a high translational energy 0-atom beam source, mass spectrometric detection of desorbed species, chemiluminescence/laser induced fluorescence detection of electronic and vibrationally excited reaction products, and Auger detection of surface adsorbed reaction products, a fundamental study of the gas surface chemistry underlying the glow process is proposed. Author

N86-13259*# Vanderbilt Univ., Nashville, Tenn. Dept. of Physics and Astronomy.
OPTICAL RADIATION FROM THE INTERACTION OF ENERGETIC ATOMS, IONS, ELECTRONS, AND PHOTONS WITH SURFACES c35
N. H. Tolk, R. G. Albridge, R. F. Haglund, Jr., and M. H. Mendenhall *In* NASA. Marshall Space Flight Center 2d Workshop on Spacecraft Glow Sep. 1985 p 191-201 refs (For primary document see N86-13239 03-88)
Avail: NTIS HC A13/MF A01 CSCL 03B

Heavy particle, electron, and UV photon bombardment of solid surfaces has been recently observed to result in the emission of infrared, visible, and ultraviolet radiation. This effect occurs over a wide range of incident projectile energies. Line radiation arising from transitions between discrete atomic or molecular levels may be attributed to the decay of excited particles which have been sputtered or electronically/chemically desorbed from the surface. Broadband continuum radiation, which is also observed, is believed to arise either from fluorescence of the near surface bulk or from the radiative decay of desorbed excited clusters. Spacecraft, in the ambient near Earth environment, are subject to such bombardment. The dynamics of energetic particle and photon beam interactions with surfaces which lead to surface erosion and glow phenomena will be treated. In addition, projected experimental and theoretical studies of oxygen and nitrogen beam surface interactions on materials characteristic of spacecraft surfaces will be discussed. Author

N86-13260*# Princeton Univ., N. J. Plasma Physics Lab.
A GROUND-BASED EXPERIMENTAL TEST PROGRAM TO DUPLICATE AND STUDY THE SPACECRAFT GLOW PHENOMENON c35
W. D. Langer, S. A. Cohen, D. M. Manos, D. H. McNeill, R. W. Motley, M. Ono, and S. Paul *In* NASA. Marshall Space Flight Center 2d Workshop on Spacecraft Glow Sep. 1985 p 202-211 refs (For primary document see N86-13239 03-88)
(Grant NAG8-521; Contract DE-AC02-76CH-03073)
Avail: NTIS HC A13/MF A01 CSCL 03B

The use of a plasma device, the Advanced Concepts Torus-I, for producing atoms and molecules to study spacecraft glow mechanisms is discussed. A biased metal plate, located in the plasma edge, is used to accelerate and neutralize plasma ions, thus generating a neutral beam with a flux approx. $>$ 5 x 10 to the 14th power/sq cm/sec at the end of a drift tube. Our initial experiments are to produce a 10 eV molecular and atomic nitrogen beam directed onto material targets. Photon emission in the spectral range 2000 to 9000 A from excited species formed on the target surface will be investigated. Author

N86-13261*# Aerospace Corp., El Segundo, Calif. Chemistry and Physics Lab.
APPLICATION OF AN ATOMIC OXYGEN BEAM FACILITY TO THE INVESTIGATION OF SHUTTLE GLOW CHEMISTRY c35
Graham S. Arnold and Daniel R. Peplinski *In* NASA. Marshall Space Flight Center 2d Workshop on Spacecraft Glow Sep. 1985 p 212-225 refs (For primary document see N86-13239 03-88)
Avail: NTIS HC A13/MF A01 CSCL 03B

A facility for the investigation of the interactions of energetic atomic oxygen with solids is described. The facility is comprised of a four chambered, differentially pumped molecular beam apparatus which can be equipped with one of a variety of sources of atomic oxygen. The primary source is a dc arc heated supersonic nozzle source which produces a flux of atomic oxygen in excess of 10 to the 15th power sq cm/sec at the target, at a velocity of 3.5 km/sec. Results of applications of this facility to the study of the reactions of atomic oxygen with carbon and polyimide films are briefly reviewed and compared to data obtained on various flights of the space shuttle. A brief discussion of possible application of this facility to investigation of chemical reactions which might contribute to atmosphere induced vehicle glow is presented. Author

N86-13262*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
AN ASSESSMENT OF THE IMPACT OF SPACECRAFT GLOW ON THE HUBBLE SPACE TELESCOPE. SUMMARY OF EXISTING OBSERVATIONS AND THEORY
John T. Clarke *In its* 2d Workshop on Spacecraft Glow Sep. 1985 p 229-242 refs (For primary document see N86-13239 03-88)
Avail: NTIS HC A13/MF A01 CSCL 03B

Visible spacecraft glow was first observed on the Atmospheric Explorer spacecraft (AE-E) and studied in some detail with the Visible Airglow Experiment (VAE). The AE-E was a spin-stabilized spacecraft without thrusters at an altitude of 140 to 280 km. The VAE contained six visible wavelength photometers that measured a glow spectrum which: (1) rose steeply in the red, (2) decreased with a cos cubed PH1 dependence from pointing into the ram direction of the spacecraft orbital motion, and (3) decreased in intensity with increasing altitude with the same dependence as the measured atomic oxygen number atmospheric density (O) and not with the measured molecular nitrogen density (N sub 2). It is proposed that the glow is produced by chemical reactions on the

spacecraft surface as it sweeps through the atmospheric O, with roughly 5-8 eV per O atom available for excitation from the orbital motion of the spacecraft. This glow may in principal be produced by any of a number of species, including molecular band emission from OH, NO, and NO2. An attempt is made to scale the observed glow to the Hubble space telescope. Author

N86-13263*# Smithsonian Astrophysical Observatory, Cambridge, Mass.
INFRARED MEASUREMENTS OF SPACECRAFT GLOW PLANNED FOR SPACELAB 2 c35
Giovanni G. Fazio and David G. Koch *In* NASA. Marshall Space Flight Center 2d Workshop on Spacecraft Glow Sep. 1985 p 243-249 refs (For primary document see N86-13239 03-88) (Contract NAS8-32845)
Avail: NTIS HC A13/MF A01 CSCL 03B

A liquid helium cooled infrared telescope (IRT) was to be flown in July 1985 on Spacelab 2. The instrument is designed to measure both diffuse and discrete infrared astronomical sources, including the zodiacal light, galactic, and extragalactic components, as well as to evaluate the induced Orbiter environment. The focal plane contains ten photoconductive detectors covering six broad bands from 2 to 120 microns. Each detector has a 0.5 by 1.0 deg field of view optimized for detection of extended sources of IR radiation. Except for the 2 micron detector, the system noise is limited by the sky background noise. The measurements planned for the IRT use the 1 meter base of the Plasma Diagnostic Package (PDP), an already existing SL 2 experiment, as the glow generating surface. The measurements are repeated changing the position of the PDP, the attitude of the Orbiter, and the ram direction in an effort to remove both the thermal component of the PDP emission and the cosmic background radiation. Author

N86-13264*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
PLANNED INVESTIGATION OF INFRARED EMISSIONS ASSOCIATED WITH THE INDUCED SPACECRAFT GLOW: A SHUTTLE INFRARED GLOW EXPERIMENT (SIRGE) c35
Michael J. Mumma and Donald E. Jennings *In* NASA. Marshall Space Flight Center 2d Workshop on Spacecraft Glow Sep. 1985 p 250-259 refs (For primary document see N86-13239 03-88)
Avail: NTIS HC A13/MF A01 CSCL 03B

The characteristics of infrared molecular emissions induced by energetic collisions between ambient atmospheric species and surfaces in Earth orbit are investigated, using a low-nitrogen-cooled filter wheel photometer covering the wavelength range 0.9-.5 microns with a resolving power Lambda/Delta Lambda of approximately 100. This resolving power is sufficient for identification of the molecular or atomic fluorescent spaces causing the glow. Author

N86-13265*# Lockheed Missiles and Space Co., Palo Alto, Calif.
DATA REQUIREMENTS FOR VERIFICATION OF RAM GLOW CHEMISTRY c35
Gary R. Swenson and Steven B. Mende *In* NASA. Marshall Space Flight Center 2d Workshop on Spacecraft Glow Sep. 1985 p 260-268 (For primary document see N86-13239 03-88)
Avail: NTIS HC A13/MF A01 CSCL 03B

A set of questions is posed regarding the surface chemistry producing the ram glow on the space shuttle. The questions surround verification of the chemical cycle involved in the physical processes leading to the glow. The questions, and a matrix of measurements required for most answers, are presented. The measurements include knowledge of the flux composition to and from a ram surface as well as spectroscopic signatures from the U to visible to IR. A pallet set of experiments proposed to accomplish the measurements is discussed. An interim experiment involving an available infrared instrument to be operated from the shuttle Orbiter cabin is also be discussed. Author

N86-13266*# Utah State Univ., Logan. Dept. of Physics.
A POSSIBLE GLOW EXPERIMENT FOR THE EOM 1-2 MISSION Abstract Only c35
Marsha R. Torr *In* NASA. Marshall Space Flight Center 2d Workshop on Spacecraft Glow Sep. 1985 p 269 (For primary document see N86-13239 03-88)
Avail: NTIS HC A13/MF A01 CSCL 03B

A possible opportunity for study of surface glow exists during the Environmental Observation Mission (EOM) 1-2 mission scheduled for launch on September 3, 1986. The EOM 1-2 payload includes spectroscopic and photometric instruments which operate in wavelength regions of great interest to the glow assessment activity. However, as in the case of many remote sensing instruments, these are located in the payload bay in such a way as to avoid viewing any shuttle or payload surfaces. If these instruments are to measure the spectral characteristics of surfaces, it is necessary for such surfaces to be positioned in the field of view of these instruments for the duration of the particular measurement sequence. It is possible that the shuttle of which the EOM 1-2 payload flies will have an Remote Manipulator System (RMS) in place. An assessment has shown that it is indeed feasible to place a four-sided cuff around the end of the RMS. The four sides, each coated with a different material, can then be positioned in turn above the instruments, and in such a way that the surface is alternately pointed into the ram and into the wake. Author

N86-13267*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
SPACE SHUTTLE MECHANISTIC STUDIES TO CHARACTERIZE ATOMIC OXYGEN INTERACTIONS WITH SURFACES c35
Lubert J. Leger and James T. Visentine *In* NASA. Marshall Space Flight Center 2d Workshop on Spacecraft Glow Sep. 1985 p 270-273 (For primary document see N86-13239 03-88)
Avail: NTIS HC A13/MF A01 CSCL 03B

A materials interaction experiment has been approved to study atomic oxygen interaction mechanisms and develop coatings for Space Station elements requiring long-lived operation in the LEO environment. A brief summary of this experiment is presented and the required exposure conditions are reviewed. Author

N86-13268*# Science Applications International Corp., Bellevue, Wash.
THE SHUTTLE GLOW: A PROGRAM TO STUDY THE RAM-INDUCED PHENOMENA c35
Hugh R. Anderson *In* NASA. Marshall Space Flight Center 2d Workshop on Spacecraft Glow Sep. 1985 p 274-276 (For primary document see N86-13239 03-88)
Avail: NTIS HC A13/MF A01 CSCL 03B

In January 1984, a proposal was submitted to NASA Headquarters entitled The Shuttle Glow: A Program to Determine the Physics of the Ram induced Phenomena. This proposal included the following elements in a shuttlebased experiment: (1) The use of a special flat generating surface $>$ 1 x 3 m on which the glow can be produced and observed. This surface will be maneuvered to vary the orientation of ram flow and of projected component of geomagnetic field. (2) Remotely mounted optical instruments to view the glowing layer on the plate. By scanning, the variation of radiance as a function of wavelength and standoff distance from the plate will be observed looking parallel to the plate. (3) The preferred location of the generating plate and in situ diagnostics is on the end of the Remote Manipulator System (RMS) arm.
F.M.R.

N86-13269*# Colorado Univ., Boulder. Lab. for Atmospheric and Space Physics.
SURVEY OF ULTRAVIOLET SHUTTLE GLOW Abstract Only c35
Kerry A. Spear, Gregory J. Uckler, and Kent Tobiska *In* NASA. Marshall Space Flight Center 2d Workshop on Spacecraft Glow Sep. 1985 p 277 (For primary document see N86-13239 03-88)
Avail: NTIS HC A13/MF A01 CSCL 03B

The University of Colorado Get Away Special (GAS) project utilizes the efforts of its students to place experiments on the shuttle. The objective of one experiment, the shuttle glow study, is to conduct a general survey of emissions in the ultraviolet near

vehicle surfaces. An approximate wavelength range of 1900 to 3000 A will be scanned to observe predominant features. Special emphasis will be placed on studying the band structure of NO near 2000 A and the Mg+ line at 2800 A. The spectrometer, of Ebert-Faste 1/8-meter design, will perform the experiment during spacecraft night. It will be oriented such that the optical axis points to the cargo bay zenith. In order to direct the field-of-view of the instrument onto the shuttle vertical stabilizer (tail), a mirror assembly is employed. The mirror system has been designed to rotate through 7.5 degrees of arc using 10 positions resulting in a spatial resolution of 30 x 3 cm, with the larger dimension corresponding to the horizontal direction. Such a configuration can be attained from the forwardmost position in the cargo bay. Each spatial position will be subjected to a full spectral scan with a resolution on the order of 10 A. Author

89 ASTRONOMY

Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

N86-13270 California Univ., Berkeley.
NELL OBSERVATIONS OF THE GALACTIC CENTER: THE VELOCITY FIELD AND MASS DISTRIBUTION Ph.D. Thesis
Eugene Serabyn 1984 132 p
Avail: Univ. Microfilms Order No. DA8512986

The velocity field within 2% of the galactic center was investigated by observing the 12.8 micron fine-structure line emission from Sgr A West. The observations show regular variations in velocity along several of the most prominent radio continuum features, indicating the presence of at least two large-scale flows of ionized gas. The inferred mass distribution is too centrally peaked to be due to a spherical isothermal stellar cluster implying that a substantial fraction of the mass located within 1.7% of the center is contained in a centrally condensed form, possibly in a massive black hole of mass approx. 3.4 x 1000,000 M sub. The best fit orbits occur under the assumption that the point mass is near the 2 micron source IRS 16 NE. The flow at r approx. 1.7% is most probably located on the inner edge of the ring of dust and neutral gas which orbits about the center at larger radii. Consequently, the source or sources of the ionization must be centrally located. Shielding of various portions of the ring from the center ionizing flux may play a role in determining the distribution of the ionized gas in Sgr A West. It is concluded that a single object may be the primary source of energy for the central few parsecs of the galaxy. Author

N86-13271*# Smithsonian Astrophysical Observatory, Cambridge, Mass.
BALLOON-BORNE THREE-METER TELESCOPE FOR FAR-INFRARED AND SUBMILLIMETER ASTRONOMY Semiannual Status Report, 1 Mar. - 31 Aug. 1985
Giovanni G. Fazio Oct. 1985 163 p refs
(Grant NAGw-509)
(NASA-CR-176347; NAS 1.26:176347; SASR-4) Avail: NTIS HC A08/MF A01 CSCL 03A

Presented are scientific objectives, engineering analysis and design, and results of technology development for a Three-Meter Balloon-Borne Far-Infrared and Submillimeter Telescope. The scientific rationale is based on two crucial instrumental capabilities: high angular resolution which approaches eight arcseconds at one hundred micron wavelength, and high resolving power spectroscopy with good sensitivity throughout the telescope's 30-micron to 1-mm wavelength range. The high angular resolution will allow us to resolve and study in detail such objects as collapsing protostellar condensations in our own galaxy, clusters of protostars in the Magellanic clouds, giant molecular clouds in nearby galaxies, and spiral arms in distant galaxies. The large aperture of the telescope will permit sensitive spectral line measurements of molecules, atoms, and ions, which can be used to probe the physical, chemical, and dynamical conditions in a wide variety of objects. Author

N86-13272*# Citadel Coll., Charleston, S.C.
THE FIELD HORIZONTAL-BRANCH STAR HD 109995: NEW RESULTS WITH COADDED ULTRAVIOLET AND OPTICAL REGION SPECTRA
Saul J. Adelman and David S. Leckrone 1985 8 p refs
(Grant NAG5-218)
(NASA-CR-176327; NAS 1.26:176327) Avail: NTIS HC A02/MF A01 CSCL 03A

A comprehensive ultraviolet and optical region abundance analysis of the field horizontal branch Population 2 A-type star HD 109995 is described. Coaddition of IUE high dispersion images and DAO 6.5 A/mm IIaO spectrograms improved the signal-to-noise ratio of the data. We have identified ultraviolet lines whose analysis will provide more complete and accurate elemental abundances than those obtained from optical region spectra alone. A preliminary elemental abundance analysis of the optical region shows that log Z/Z (solar) approx. = -2. A first attempt to synthesize two Fe 2 ultraviolet resonance lines yields an iron abundance a few tenths of a deg higher than the average obtained from optical region Fe 2 lines. Author

N86-13273*# Missouri Univ., St. Louis. Dept. of Physics.
ULTRAVIOLET OBSERVATIONS OF LOW-EXCITATION HERBIG-HARO OBJECTS Final Technical Report, Jul. 1982 - Sep. 1985
Richard D. Schwartz 1985 4 p refs
(Grant NAG5-243)
(NASA-CR-176164; NAS 1.26:176164) Avail: NTIS HC A02/MF A01 CSCL 03A

The Herbig-Haro (HH) objects rank among the faintest objects (v approx. 17) observed with the I.U.E. Expectations that the low-excitation shock-excited HHs should be dominated by H two-photon (2q) UV emission were borne out in the first observation of HH 43 and 47 obtained in 1982. The UV continuous energy distributions in the SWP spectra of these objects were found to peak near 1500 Angstroms as predicted by the 2q hypothesis. In addition, emission lines in the Lyman band of H sub 2, excited by Lyman alpha fluorescence, were detected in HH 43. It is not clear if the molecular gas is coextensive with the atomic gas responsible for the optical emission, or if the molecular gas is immediately adjacent to the region of optical emission. The two-photon energy distribution and H sub 2 fluorescent emission were previously discussed. G.L.C.

N86-13274*# Smithsonian Astrophysical Observatory, Cambridge, Mass.
COMBINED ULTRAVIOLET STUDIES OF ASTRONOMICAL SOURCE Semiannual Progress Report, 1 Feb. - 31 Jul. 1985
A. K. Dupress, S. L. Baliunas, W. P. Blair, L. W. Hartmann, J. P. Huchra, J. C. Raymond, G. H. Smith, and D. R. Soderblom Aug. 1985 12 p refs
(Grant NAG5-87)
(NASA-CR-176165; NAS 1.26:176165; SAPR-10) Avail: NTIS HC A02/MF A01 CSCL 03A

As part of its Ultraviolet Studies of Astronomical Sources the Smithsonian Astrophysical Observatory for the period 1 Feb. 1985 to 31 July 1985 observed the following: the Cygnus Loop; oxygen-rich supernova remnants in 1E0102-72; the Large Magellanic Cloud supernova remnants; P Cygni profiles in dwarf novae; soft X-ray photoionization of interstellar gas; spectral variations in AM Her stars; the mass of Feige 24; atmospheric inhomogeneities in Lambda Andromedae and FF Aquarii; photometric and spectroscopic observation of Capella; Alpha Orionis; metal deficient giant stars; M 67 giants; high-velocity winds from giant stars; accretion disk parameters in cataclysmic variables; chromospheric emission of late-type dwarfs in visual binaries; chromospheres and transient regions of stars in the Ursa Major group; and low-metallicity blue galaxies. F.M.R.

N86-12410# Joint Publications Research Service, Arlington, Va.
MICROCOMPUTER-CONTROLLED CLOSED-LOOP SYSTEM FOR POSITIONING RADIO TELESCOPE
Zhu Liqing, Chu Yingyi, and Zhang Zhenchao *In its* China Rept.:

Sci. and Technol. (JPRS-CST-85-017) 11 Jun. 1985 p 69-77 ref Transl. into ENGLISH from Wei Jisuanji Yingyong (Beijing), no. 4, Nov. 1984 p 26-30 (For primary document see N86-12408 03-31)
Avail: NTIS HC A08/MF A01

90 ASTROPHYSICS

Includes cosmology; and interstellar and interplanetary gases and dust.

N86-13275 Texas Univ., Austin.
PHYSICO-CHEMICAL CONDITIONS IN CIRCUMSTELLAR SHELLS OF EVOLVED OXYGEN-RICH M STARS Ph.D. Thesis
David Bruce Slavsky 1985 287 p
Avail: Univ. Microfilms Order No. DA8513301

The physical and chemical conditions in circumstellar shells of evolved oxygen-rich stars were studied. Time dependent non-equilibrium chemical calculations for several gas phase species were performed to determine their radially dependent abundances. The species are formed from the eight elements H, C, N, O, S, Si, Al, and Cl. The energy equation included contributions from the cooling of the gas due to expansion, heating from gas-grain collisions, and molecular cooling from 2CO, and H2O. The circumstellar chemistry is also affected by ultraviolet radiation. It was found that the total column density through the shell determines two important shell characteristics. Higher densities result in large non-adiabatic contributions to the energy equation, and it is shown that for the highest densities studied, the temperature profile is determined by the non-adiabatic terms. The total column density determines the optical depth through the shell in the UV, which controls the position in the shell where photo-induced chemistry can begin. Radial abundances of species such as OH, SiO, and SO, which can be formed as a result of H2O dissociation, are diagnostic of the total column density of gas through the shell. Observations of H2O and other molecules in shells of stars possessing chromospheres place constraints on the total density through the shell. It is shown that changing the total density by an order of magnitude leads to large changes in the total attenuation of UV radiation, which determines the level of molecular association. Author

N86-13276 California Univ., Berkeley.
WAVE PROPAGATION AND PAIR FORMATION IN PULSAR MAGNETOSPHERES Ph.D. Thesis
John Juil Barnard 1984 215 p
Avail: Univ. Microfilms Order No. DA8512748

The propagation of electromagnetic waves through a relativistically outflowing electron positron plasma is investigated. The requirements for the formation of such a plasma in pulsar magnetospheres are determined. The refraction of electromagnetic waves through pulsar magnetosphere is investigated. The dispersion relation is derived for propagation in an equal density electron positron plasma in the approximation that the magnetic field is infinite, for both cold and hot distribution functions. The energy transfer rate of Alfven waves is calculated into fast mode waves from two different mechanisms: linear gradient coupling and nonlinear wave-wave coupling. The relevancy of these mechanisms to pulsars is discussed. The minimum requirements are calculated for pair creation in a pulsar magnetic field with dipolar and quadrupolar components, for several scenarios concerning the evolutionary history of the magnetic field. Dissert. Abstr.

N86-13277 California Univ., Berkeley.
DIFFRACTION-LIMITED TEN MICRON IMAGING OF CIRCUMSTELLAR DUST WITH A DETECTOR ARRAY Ph.D. Thesis
Eric Edward Bloemhof 1984 148 p
Avail: Univ. Microfilms Order No. DA8512759

An imaging system has been constructed which achieves diffraction limited spatial resolution (about 0.6) at a wavelength of 10 micro m on large telescopes. The system uses an array of 25 photovoltaic detectors in the focal plane, arranged along two crossed arms. The very small physical size of individual detectors, and the use of drift scans made with a stationary telescope, permit reliable imaging on a spatial scale not easily probed before. Several broad band interference filters (with delta lambda/lambda approx. 0.1) permit imaging on and off the 9.7 micro m spectral feature due to silicate dust particles. The array system has been used to map the circumstellar dust envelopes of several late type stars, including alpha Scorpii, Orionis, and IRC + 10216. The first two objects, oxygen rich type M supergiants, show faint extended emission around an unresolved stellar photosphere which dominates the surface brightness. Particularly accurate east-west profiles of the brightness distributions are obtained, and in the case of alpha Orionis a distinct east-west asymmetry was observed in February 1983. Dissert. Abstr.

N86-13278# Lawrence Livermore National Lab., Calif.
NUCLEAR INFORMATION NEEDS FOR THE ASTROPHYSICAL s-PROCESS
G. J. Mathews, W. M. Howard, K. Takahashi, and R. A. Ward May 1985 6 p Presented at the Intern. Conf. on Nucl. Data for Basic and Appl. Sci., Santa Fe, N. Mex., 13 May 1985
(Contract W-7405-eng-48)
(DE85-012913; UCRL-917-5; CONF-850507-32) Avail: NTIS HC A02/MF A01

The astrophysical s process is a sequence of neutron capture and beta decay reactions on a slow time scale compared to beta decay lifetimes near the line of stability. We systematically study this detailed sequence of neutron capture, continuum and bound state beta decay, positron decay, and electron capture reactions that comprise the s process for a broad range of astrophysical environments. Our results are then compared with the solar system abundances of heavy elements to determine the range of physical conditions responsible for their nucleosynthesis. The nuclear data needs are extensive but have begun to be precise enough to allow for a consistent interpretation of the astrophysical site for the s process. DOE

91 LUNAR AND PLANETARY EXPLORATION

Includes planetology; and manned and unmanned flights. For spacecraft design see *18 Spacecraft Design Testing, and Performance.* For space stations see *15 Launch Vehicles and Space Vehicles.*

N86-13279*# California Univ., San Diego, La Jolla. Center for Astrophysics and Space Sciences.
TRAPPED PARTICLE ABSORPTION BY THE RING OF JUPITER Final Report, 1 Sep. 1984 - 31 Aug. 1985
Walker Fillius 31 Aug. 1985 48 p refs
(Grant NAGw-652)
(NASA-CR-174408; NAS 1.26:174408) Avail: NTIS HC A03/MF A01 CSCL 03B

The ring systems of Jupiter and Saturn, and their interaction with the magnetosphere were studied. Opportunities to improve the understanding of the sweeping effect of orbiting material on trapped radiation, and the use of this process to gain insight on both the trapped radiation and the target material are outlined. Within the cosmogony of Hannes Alfven, this mechanism is also the key to understanding the formation of many of the features of the Saturnian rings. A better understanding of the sweeping effect would also help to clarify this process. For individual titles, see N86-13280 through N86-13281.

N86-13280*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
A NOTE ON JUPITER'S GOSSAMER RING Final Report
D. A. Mendis, J. R. Hill, W. Fillius, and T. G. Northrop *In* California Univ., San Diego, La Jolla Trapped Particle Absorption by the Ring of Jupiter 31 Aug. 1985 9 p refs Prepared in cooperation

with California Univ., San Diego, La Jolla (For primary document see N86-13279 03-91)
(Grants NsG-7102; NAGw-399; NAGw-336)
Avail: NTIS HC A03/MF A01 CSCL 03B

The newly discovered gossamer ring of Jupiter, composed largely of micron-sized grains, exhibits a significant peak very near the synchronous radius. It is believed that this peak is associated with an unobserved source consisting of large bodies that straddle the synchronous orbit. An alternative evolutionary mechanism is offered, which is the gyrophase drift towards the synchronous orbit, of fine grains, which necessarily are electrostatically charged within the Jovian magnetosphere. E.A.K.

N86-13281*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ELECTRONS AND COSMIC RAY PRODUCED IN SATURN'S INNER MAGNETOSPHERE
T. G. Northrop and Walker Fillius (California Univ., San Diego, La Jolla) *In* California Univ., San Diego, La Jolla Trapped Particle Absorption by the Ring of Jupiter 31 Aug. 1985 30 p refs Previously announced as N85-26546 (For primary document see N86-13279 03-91)
(Grants NAGw-336; NAGw-652)
Avail: NTIS HC A03/MF A01 CSCL 03B

The Cerenkov detector on Pioneer 11 previously observed Crand protons above 600 MeV in Saturn's inner magnetosphere, mixed with a poorly understood background of energetic electrons. The electron count is separated from the proton counts and the first-order angular distributions are established for each species. To do this the theoretical relationships among the harmonic coefficients of the count rate is used as a function of spacecraft roll angle. The majority of the counts were electrons with energy above several MeV; i.e., with drift periods shorter than the satellite orbital resonance. The electrons have isotropic pitch angle distributions, and the protons pancake over most of the region between Nimas and the rings, although there is a small region of dumbbell proton distributions in the vicinity of Janus and Epimetheus. Author

N86-13282*# Lunar and Planetary Inst., Houston, Tex.
WORKSHOP ON WATER ON MARS
Stephen Clifford, ed. Dec. 1984 109 p refs Workshop held at Moffett Field, Calif., 30 Nov. - 1 Dec. 1984
(Contract NASw-3389)
(NASA-CR-176289; NAS 1.26:176289; LPI-TR-85-03) Avail: NTIS HC A06/MF A01 CSCL 03B

The opening session of the Workshop focused on one of the most debated areas of Mars volatiles research-the size of the planet's past and present bulk water content. Current estimates of the inventory of H2O on Mars range from an equivalent layer of liquid 10-1000 meters deep averaged over the planet's surface. The most recent of these estimates, presented at the Workshop, is based on the now popular belief that the SNC class of meteorites represent actual samples of the Martian crust. From a model of planetary accretion and degassing founded on this assumption, it was determined that the present inventory of H2O on Mars is equivalent to a global layer no more than 50 meters deep. During the discussion generated by this estimate, several investigators expressed reservations about an H2O inventory as small as a few tens of meters, for it appears to directly contradict the seemingly abundant morphologic evidence that Mars is (or has been) water rich. Others, however, argued that the interpretation of much of this morphologic evidence is at best equivocal and that the case for a wet Mars is far from established. Atmospheric water vapor measurements, compiled by Earth based telescopes and the Viking Orbiter Mars Atmospheric Water Detectors (MAWD), now span a period of over six Martian years. Analysis of this data suggests that the seasonal cycle is governed by both the sublimation and condensation of H2O at the poles and by its adsorption/desorption within the regolith. So far, efforts to simulate the seasonal vapor cycle have failed to reproduce the observed behavior. B.W.

92 SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots.

N86-13283# Iowa Univ., Iowa City. Dept. of Physics and Astronomy.
ANALYSIS AND INTERPRETATION OF THE SHOCK-LIKE ELECTROSTATIC NOISE OBSERVED DURING THE AMPTE (ACTIVE MAGNETOSPHERIC PARTICLE TRACER EXPLORERS) SOLAR WIND LITHIUM RELEASES Progress Report
D. A. Gurnett, T. Z. Ma, R. R. Anderson, O. H. Bauer, and G. Haerendel May 1985 51 p
(Contracts N00014-76-C-0016; N00014-82-K-0183)
(AD-A157512; U-OF-IOWA-85-13) Avail: NTIS HC A04/MF A01 CSCL 03/2

During the AMPTE (Active Magnetospheric Particle Tracer Explorers) solar wind lithium release on September 11, and again on September 20, 1984, an intense burst of electrostatic noise was observed near the upstream edge of the ion cloud. Comparisons with measurements by the IMP-6 and ISEE-1 spacecraft show that the spectrum and overall features of this noise are very similar to electrostatic noise observed at the Earth's bow shock. A stability analysis using realistic parameters shows that the electrostatic noise can be accounted for by an ion beam-plasma instability caused by the solar wind proton beam streaming through the nearly stationary lithium cloud. The growth rate of this instability is largest when the ion density and solar wind proton density are similar, which explains why the noise only occurs near the outer edge of the ion cloud. The similarity to the noise in the Earth's bow shock suggest that a shock may exist in the solar wind plasma flow upstream of the ion cloud. If the noise is associated with a shock, then it must be an electrostatic shock, since the ion cyclotron radii are too small for the existence of a MHD shock. Since the electrostatic instability occurs at phase velocities near the lithium thermal velocity, the electrostatic turbulence may play a role in heating the lithium ions and transferring momentum from the solar wind to the ion cloud. GRA

N86-13284# Iowa Univ., Iowa City. Dept. of Physics and Astronomy.
A STATISTICAL STUDY OF SOLAR TYPE-3 BURSTS AND AURORAL KILOMETRIC RADIATION ONSETS Progress Report
W. M. Farrell and D. A. Gurnett Mar. 1985 38 p
(Contract N00014-76-C-0016)
(AD-A158408; U-OF-IOWA-85-7) Avail: NTIS HC A03/MF A01 CSCL 04/1

Simultaneous occurrences of Type-3 solar radio bursts and auroral kilometric radiation were observed by Calvert using ISEE-1 spectrograms. He presented evidence suggesting that the incoming Type-3 burst stimulates the onset of auroral kilometric radiation. This paper presents a statistical study of the correlation between Type-3 bursts and auroral kilometric radiation. A superposed epoch analysis was performed on as many as 186 Type-3 events. The Type-3 bursts were detected by the ISEE-3 spacecraft on the sunward side of the Earth. At the same time the IMP-8 spacecraft was used to detect onsets of kilometric radiation on the nightside of the Earth. For each event, the intensities measured by ISEE-3 (Type-3 intensities) were subtracted from the intensities measured by IMP-8 (Type 3 and possible AKR intensities). The resulting intensities for each event were then added to determine if kilometric radiation was preferentially observed following a Type-3 burst. This analysis was performed at frequencies of 100 kHz, 178 kHz and 500 kHz. The results of this study show that a statistically significant correlation exists between incoming Type-3 bursts from the Sun and kilometric radiation from the Earth. GRA

93 SPACE RADIATION

Includes cosmic radiation; and inner and outer Earth's radiation belts.

For biological effects of radiation see *52 Aerospace Medicine*. For theory see *73 Nuclear and High-Energy Physics*.

N86-13285*# Carnegie Institution of Washington, D. C.
X-RAYS FROM THE RADIO HALO OF VIRGO A = M87
[1985] 43 p refs
(Grants NAG8-357; NSF AST-83-51447)
(NASA-CR-176303; NAS 1.26:176303) Avail: NTIS HC A03/MF A01 CSCL 03B

The purpose of this study is to investigate in more detail the associated X-ray and radio emission in the Virgo A halo discovered by SGF. Improved Einstein HRI data and new radio maps obtained with the Very Large Array are described and the relation between the X-ray and radio structures is carefully examined. Several possible explanations are presented for the X-ray emission. The inverse compton model is found to be viable only if the magnetic field is variable and substantially weaker than the equipartition value. The principal alternative is excess thermal X-rays due to compression of the intracluster medium by the radio lobe. In either case, the association of such prominent radio and X-ray structures is unique among known radio galaxies. B.W.

N86-12687# Joint Publications Research Service, Arlington, Va.
HIGH-ELEVATION STATION'S COSMIC-RAY RECORDING SYSTEM Abstract Only
In its USSR Rept.: Earth Sci. (JPRS-UES-85-006) 19 Jun. 1985 p 71 Transl. into ENGLISH from Izv. (Moscow), 5 Apr. 1985 p 3
(For primary document see N86-12630 03-42)
Avail: NTIS HC A05/MF A01

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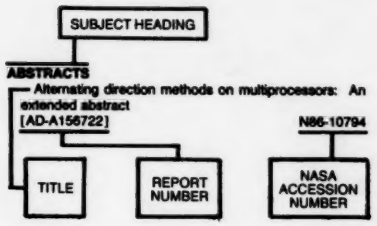

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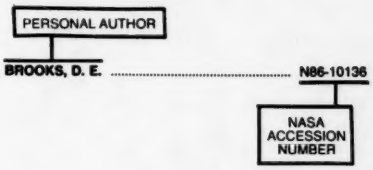

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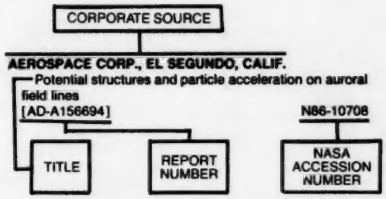

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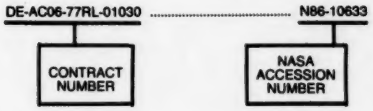

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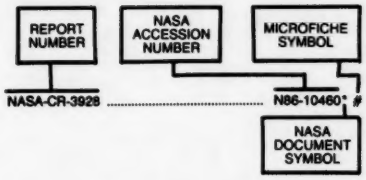

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EPA-600/D-85-111 ..... N86-12804 #
EPA-600/D-85/094 ..... N86-12906 #
EPA-600/D-85/097 ..... N86-12933 #
EPA-600/2-85/057 ..... N86-12806 #

EPA/600/D-85/077 ..... N86-12751 #
EPA/600/D-85/113 ..... N86-12809 #
EPA/908/2-84/001 ..... N86-12749 #

EP1/600/4-85/031 ..... N86-12805 #

ERL-0331-TM ..... N86-13129 #

ESD-TR-85-149-REV-1 ..... N86-12990 #

ESN-39-8 ..... N86-13237 #

E86-10003 ..... N86-12739* #
E86-10004 ..... N86-12740* #
E86-10005 ..... N86-12741* #
E86-10006 ..... N86-12742* #

FAA-APO-85-7 ..... N86-13051 #

FAA-ARP-11 ..... N86-12241 #
FAA-ARP-85-1 ..... N86-12241 #

FAA-PM-85-09 ..... N86-12920 #

FAA/CT-85/23 ..... N86-12214 #

FHWA/NJ-85/004 ..... N86-13063 #

FNAL-TM-1328 ..... N86-13101 #

FNAL/C-85/18-T ..... N86-13080 #
FNAL/C-85/59 ..... N86-13085 #
FNAL/C-85/63 ..... N86-13147 #
FNAL/C-85/84 ..... N86-13097 #

FPL-456 ..... N86-12389 #

FR2213U/4577 ..... N86-13026 #

FTD-ID(RS)T-0160-85 ..... N86-13190 #
FTD-ID(RS)T-0938-84 ..... N86-12269 #
FTD-ID(RS)T-1323-84 ..... N86-12271 #
FTD-ID(RS)T-1326-84 ..... N86-12495 #
FTD-ID(RS)T-1355-84 ..... N86-13194 #
FTD-ID(RS)T-1356-84 ..... N86-12516 #
FTD-ID(RS)T-1564-84 ..... N86-12601 #

GA-A-17940 ..... N86-13116 #

GAO/NSIAD-85-94 ..... N86-12224 #

GAO/RCED-85-24 ..... N86-12215 #

GPO-43-660 ..... N86-13233 #
GPO-54-494 ..... N86-13231 #

GRI-85/0003 ..... N86-12289 #
GRI-85/0051 ..... N86-12286 #
GRI-85/0085 ..... N86-12290 #

H-REPT-99-363 ..... N86-13231 #

HAC-FR-84-16-681-REV-A ..... N86-12619 #

HEDL-SA-3214-FP ..... N86-13008 #

HL-85-26 ..... N86-13057* #

HLSB-85 ..... N86-12748 #

HPP-84-44 ..... N86-13052 #

IA-UR-85-2220 ..... N86-12249 #

ICASE-85-40 ..... N86-12550* #

IDA-M-81 ..... N86-12262 #

IDA/HQ-85-29831 ..... N86-12262 #

IFSR-185 ..... N86-13217 #
IFSR-186 ..... N86-13172 #
IFSR-189 ..... N86-13218 #
IFSR-193 ..... N86-13171 #

IL/ENR/RE-85/02 ..... N86-12750 #

IR-2 ..... N86-12360 #

IS-M-538 ..... N86-12307 #
IS-M-553 ..... N86-13211 #

ISI-48 ..... N86-12218* #

ISR-1 ..... N86-12924 #

ISSN-0067-0340 ..... N86-12908* #
ISSN-0385-771-9 ..... N86-12383 #
ISSN-0388-9653 ..... N86-12909 #
ISSN-0389-617-X ..... N86-12372 #

ITR-2 ..... N86-12554 #

IU-CERL-RR-85-1-ONR ..... N86-12972 #

JPL-PUB-85-61 ..... N86-12919* #
JPL-PUB-85-73 ..... N86-12759* #

JPL-9950-1160 ..... N86-12312 #

JPRS-CST-85-016 ..... N86-12393 #
JPRS-CST-85-017 ..... N86-12408 #
JPRS-CST-85-018 ..... N86-12413 #
JPRS-CST-85-019 ..... N86-12966 #
JPRS-CST-85-021 ..... N86-12421 #
JPRS-CST-85-022 ..... N86-12439 #
JPRS-CST-85-024 ..... N86-12368 #
JPRS-CST-85-025 ..... N86-12444 #
JPRS-CST-85-026 ..... N86-12459 #
JPRS-CST-85-029 ..... N86-12446 #
JPRS-CST-85-030 ..... N86-12451 #
JPRS-CST-85-032 ..... N86-12462 #
JPRS-CST-85-034 ..... N86-12430 #
JPRS-CST-85-035 ..... N86-12399 #

JPRS-UES-85-006 ..... N86-12630 #
JPRS-UES-85-008 ..... N86-12697 #

K-TRANS-297 ..... N86-12323 #

KMSF-U-1567 ..... N86-13150 #

K506-1 ..... N86-12625 #

L-15955 ..... N86-12579* #
L-15969 ..... N86-12259* #
L-15997 ..... N86-13056* #
L-16015 ..... N86-12508* #
L-16022 ..... N86-13064* #

LA-UR-85-494 ..... N86-13050 #
LA-UR-85-1007 ..... N86-13107 #
LA-UR-85-1527 ..... N86-13063 #
LA-UR-85-1546 ..... N86-13081 #
LA-UR-85-1588 ..... N86-12529 #
LA-UR-85-1598 ..... N86-13078 #
LA-UR-85-1608 ..... N86-12532 #
LA-UR-85-1609 ..... N86-13087 #
LA-UR-85-1621 ..... N86-13084 #
LA-UR-85-1625 ..... N86-13082 #
LA-UR-85-1648 ..... N86-13204 #
LA-UR-85-1733 ..... N86-12966 #
LA-UR-85-1757 ..... N86-13019 #
LA-UR-85-1777 ..... N86-13106 #
LA-UR-85-1834 ..... N86-13152 #
LA-UR-85-1891 ..... N86-12527 #
LA-UR-85-1935 ..... N86-12284 #
LA-UR-85-1957 ..... N86-12285 #
LA-UR-85-1961 ..... N86-13148 #
LA-UR-85-2021 ..... N86-12519 #
LA-UR-85-2040 ..... N86-13177 #
LA-UR-85-2062 ..... N86-13134 #
LA-UR-85-2070 ..... N86-12586 #
LA-UR-85-2075 ..... N86-13090 #
LA-UR-85-2078 ..... N86-12535 #
LA-UR-85-2092 ..... N86-12904 #
LA-UR-85-2157 ..... N86-13135 #
LA-UR-85-2174 ..... N86-13141 #
LA-UR-85-2177 ..... N86-12608 #
LA-UR-85-2190 ..... N86-13062 #
LA-UR-85-2272 ..... N86-13173 #
LA-UR-85-2362 ..... N86-12589 #
LA-UR-85-2368 ..... N86-12951 #
LA-UR-85-2373 ..... N86-12998 #
LA-UR-85-2479 ..... N86-12594 #
LA-UR-85-2683 ..... N86-13199 #
LA-UR-85-3064 ..... N86-13200 #
LA-UR-85-3112 ..... N86-13102 #

LA-74-85-1596 ..... N86-13145 #
LA-74-85-2035 ..... N86-13017 #
LA-10395-MS ..... N86-13110 #
LA-10404-MS ..... N86-13167 #
LA-10420-MS ..... N86-12366 #
LA-10432-MS ..... N86-12985 #

LAIR-IR-200 ..... N86-12960 #

LARS-TR-071584 ..... N86-12741* #

LBL-18384 ..... N86-12952 #
LBL-18711 ..... N86-13079 #
LBL-18797 ..... N86-13074 #
LBL-18939 ..... N86-13092 #
LBL-18961 ..... N86-13095 #
LBL-18964 ..... N86-13196 #
LBL-18985 ..... N86-13176 #
LBL-19011 ..... N86-13174 #
LBL-19084 ..... N86-12578 #
LBL-19291 ..... N86-12282 #
LBL-19302 ..... N86-12903 #
LBL-19579 ..... N86-13054 #
LBL-19583 ..... N86-13076 #
LBL-19593 ..... N86-13093 #
LBL-19671 ..... N86-13214 #
LBL-19755 ..... N86-12521 #
LBL-19827 ..... N86-13072 #

LC-84-600270 ..... N86-12286 #

LHNCBC-85-1 ..... N86-12987 #

LPI-TR-85-03 ..... N86-13282* #

M-502 ..... N86-13239* #

MAP-HANDBOOK-16 ..... N86-12814* #
MAP-HANDBOOK-17 ..... N86-12837* #

MIT/LCS/TR-339 ..... N86-12979 #

MLM-3254 ..... N86-12797 #
MLM-3267 ..... N86-12326 #

MRC-TSR-2814 ..... N86-12558 #
MRC-TSR-2819 ..... N86-13034 #
MRC-TSR-2820 ..... N86-13038 #
MRC-TSR-2824 ..... N86-13037 #
MRC-TSR-2826 ..... N86-13035 #
MRC-TSR-2828 ..... N86-13036 #
MRC-TSR-2829 ..... N86-13032 #
MRC-TSR-2832 ..... N86-13039 #
MRC-TSR-2833 ..... N86-13033 #

MRI/SOL-0101 ..... N86-12756 #

MRL-R-959 ..... N86-12620 #

MSC-TN-11 ..... N86-12909 #

MTR-8707-REV-1 ..... N86-12990 #

NADC-84096-60 ..... N86-12298 #
NADC-84162-60 ..... N86-12213 #

NAS 1.15:85705 ..... N86-12206* #
NAS 1.15:86430 ..... N86-12259* #
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NAS 1.15:88178 ..... N86-13225* #
NAS 1.21:7011(276) N86-12954*
NAS 1.21:7041(46) N86-12738*
NAS 1.26:3805 ..... N86-12208* #
NAS 1.26:3806 ..... N86-12202* #
NAS 1.26:3919 ..... N86-12203* #
NAS 1.26:3922(02) ..... N86-12949* #
NAS 1.26:3933 ..... N86-12218* #
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NAS 1.60:2513 ..... N86-12609* #
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NASA-SP-7011(276) N86-12954*
NASA-SP-7041(46) N86-12738*

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NASA-TM-88178 ..... N86-13225* #

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NASA-TP-2499 ..... N86-12295* #
NASA-TP-2513 ..... N86-12609* #
NASA-TP-2518 ..... N86-13056* #

NAUFP-202-3 ..... N86-13219* #

NA84-0148 ..... N86-12205* #

NBDL-84R008 ..... N86-12989 #

NBSIR-85/3025-8 ..... N86-13183 #
NBSIR-85/3130 ..... N86-12291 #
NBSIR-85/3150 ..... N86-12803 #
NBSIR-85/3165 ..... N86-12988 #

NCAR/TN-252/STR ..... N86-12948 #

NCEL-TN-1724 ..... N86-12778 #

NGS-31 ..... N86-12905 #

NIPER-75 ..... N86-12281 #

NOAA-NWS-ERCP-31 ..... N86-12934 #
NOAA-NWS-ERCP-32 ..... N86-12935 #

NOAA-TM-ERL-ARL-135 ..... N86-12807 #

NOAA-TM-ERL-ESG-8 ..... N86-12931 #

NOAA-TM-ERL-EST-16 ..... N86-12929 #

NOAA-TM-ERL-WPL-123 ..... N86-13137 #

NOAA-TM-MNFS-SEFC-153 ..... N86-12755 #

NOAA-TM-NESDIS-AISC-2 ..... N86-12927 #

NOAA-TM-NWS-ER-68 ..... N86-12932 #

NOAA-TM-NWS-TDL-75 ..... N86-12936 #

NOAA-TM-NWS-WR-189 ..... N86-12930 #

NOAA-TR-NOS-109 ..... N86-12905 #

NORDA-93 ..... N86-12744 #

NPRDC-TR-85-10 ..... N86-12971 #

NPS63-84-008 ..... N86-12921 #
NPS63-85-001 ..... N86-12922* #

NRL-MR-5605 ..... N86-12492 #
NRL-MR-5623 ..... N86-13140 #

NSWC/MP-85-58 ..... N86-13238 #

NSWC/TR-85-98 ..... N86-12776 #
NSWC/TR-85-120 ..... N86-13030 #

NTIA-84-165 ..... N86-12502 #
NTIA-85-175 ..... N86-12501 #

NTIS/SW/MT-85/001A ..... N86-13021 #

NWC-TP-6563-REV-1 ..... N86-12777 #
NWC-TP-6575-CH-1/4 ..... N86-12210 #
NWC-TP-6618 ..... N86-12231 #
NWC-TP-6619-PT-2 ..... N86-12361 #

OE-85-10 ..... N86-12557 #

ORNL-6169 ..... N86-12321 #
ORNL-6201 ..... N86-12953 #

ORNL/CON-162 ..... N86-12615 #

ORNL/SUB-79/33200/18 ..... N86-13096 #
ORNL/SUB-84-05907/1 ..... N86-12614 #
ORNL/SUB-84-95128/2 ..... N86-12534 #

ORNL/TM-9241 ..... N86-13020 #
ORNL/TM-9446 ..... N86-12596 #
ORNL/TM-9470 ..... N86-12626 #
ORNL/TM-9531 ..... N86-13166 #
ORNL/TM-9595 ..... N86-13215 #

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PB85-187888 ..... N86-12930 #
PB85-188274 ..... N86-12948 #
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